INDEX.

ILLUSTRATED ARTICLES.

Aden's Telephone, 387
Africa, Central, Future Trade in, 311
Agitator, or Dolly Tub; Pan Amalgamation of Silver Ores, 473
Agricultural Show, The Royal, at Kilburn:
Butter Kegs, Allen Ransome and Company's Machinery for Making, 552, 553
Centrifugal Pump, J. and H. Gwynne's, 569
Drum Guard for Thrashing Machine, Marshall, Sons, and Company's, 580
Engines:
Cambridge's, 1847, 549
Clayton and Shuttleworth's Straw-Burning Portable, 572
Clerk's Gas, 550
Cochran's, and Boiler, 576
Fowler, J., and Company's Semi-Portable, 560
Garrett and Sons' Portable Mining, 578
Otto Silent 16-Horse Gas, 565
Shanks and Sons' Horizontal, 561
Trevithick's High-Pressure, 1811, 548
Vosper's Four-Cylinder, 569
Willan's Compound, 577
Firegrates for Unbroken and Chopped Straw, Garrett and Sons', 573
Harrow, Old Reversible Norwegian, 533
Horse Rollers, Old, 533
Lever Anchor, Savage's Automatic, 572
Road Roller, Aveling and Porter's Steam, 564
Thrashing Machines:
Clayton and Shuttleworth's, with Side Feed, 556
Cyprus, 538
Garrett and Sons', 541
Nalder and Nalder's, and Straw Elevator, 540, 541
Under-Gear for 8-Horse Portable Engine, Marshall, Sons, and Company's, 577
Winnowing Machine, Old, 536
Albany and Rensselaer Iron and Steel Company's Works, U.S.A., The Porter Allen Engine at the, 107, 115
Amalgamation, Pan, of Silver Ores, in Nevada and Colorado, 43, 128, 134, 135, 190, 191, 370, 473, 491, 493
American Iron and Steel Works (*See Iron and Steel Works, American*)
Analysis of Iron and Steel, The Application of the Spectroscope to the, 127, 429, 430, 431
Anchor, Savage's Automatic Lever, 572
Apparatus for Replacing Derailed Rolling Stock; The Paris Exhibition, 459
Apparatus for Testing Tyres on the Western Railway of France; The Paris Exhibition, 494, 495
Armour Plates, The Effects of Shot and Shell on, 70, 71
Articulating Telephones, 467, 488, 489
Asquith's Slotting Machine, 257
Assay Office of the Consolidated Virginia Mill, Plan of the; Pan Amalgamation of Silver Ores, 491
Austrian State Railway Works, Tyre-Grinding Lathe at the, 391
Automatic Brake, The Westinghouse, 85
Automatic Expansion Gear, Halpin's Engine with, 480
Aveling and Porter's Steam Road Roller, 564
Axles of Tank Engines, The Distribution of Load upon the, 441
Ayr Dock, Melk and Nisbet's, 242

Bagnall's Tank Locomotive for the Wotton Tramway, 17
Bailey's Reaper, 1822, 545
Balance, Professor Hughes's Induction, 218, 219, 458, 486
Balancing Carriage Wheels, Apparatus for; The Paris Exhibition, 110
Balfour and Company's Auxiliary Pumping Engine, with "Comet" Pumps, for the Yacht "Wanderer," 568
Band Saws for Cutting Deals, Furness and Company's, 235
Bar, 4-in. Square, of Bessemer Steel, Twisted Hot, 414
Bars and Rails, Tweddell's Hydraulic Shears for; The Paris Exhibition, 67
Bars, River, The Removal of, by Induced Tidal Scour, 108, 474
Batteries, Voltaic; Lighting by Electricity, 513
Beam Engine, Thomas and Powell's Compound; The Paris Exhibition, 50
Bearing for Loose Pulleys, Kitson's, 243
Belgian State Railways, Passenger Locomotive for the; The Paris Exhibition, 172, 173, 174
Belgian State Railways, Steam Carriage for the; The Paris Exhibition, 214
Bell's Reaper, 1826, 545
Bell Telephone, The, 498
Bessemer Steel Plate Treated Cold, 414
Bessemer Steel Rail Twisted Cold, 414
Bessemer Steel, Samples of, 414, 415
Bessemer Steel, 4 in. Square Bar, Twisted Hot, 414
Bevel Gear-Cutting Machine, Fetu and Delfage's; The Paris Exhibition, 195
Blast Furnace at the Durham Iron Works, Pennsylvania, U.S.A.; American Iron and Steel Works, 150
Blast-Heating Stoves at the Durham Iron Works, Pennsylvania, U.S.A.; American Iron and Steel Works, 151
Boat, The Herreshoff Torpedo, 93, 94, 122
Boiler, Carnaire and Montellier's Vertical Tubular, 284
Boiler Drilling Machine, Tweedy's, 340
Boiler and Engine, Cochran's, 576
Boiler Explosions in 1878; E. B. Marten's Annual Report, 176
Boiler Making, Fractures in Steel Plates for; Diagrams, 415
Boiler, 1765, Smeaton's Portable, 548
Boiler with Ten-Brink Firegrate, Escher, Wyss, and Company's; The Paris Exhibition, 437
Boilers, Iron and Steel, 527, 528, 529, 581
Boilers, Verderber's Locomotive, 114
Boucher's Calculating Circle, 498
Bourboule and Royat Mineral Waters, The, 337
Box and Table for Mercury Bags; Pan Amalgamation of Silver Ores, 473
Boyer's High-Pressure Marine Boiler, 410
Brake, The Westinghouse, 85
Brakes, Continuous; Diagrams, 383
Brakes on Railway Trains, The Effect of, 374
Breguet's Telephone, 489
Bricks, Consolidated Virginia; Pan Amalgamation of Silver Ores, 493
Bridge over the Orange River at Bethalie, Cape of Good Hope, 371
Bridge, Sedley's Proposed High-Level, over the Thames, 411, 416
Buoy, Courtnay's Self-Acting Syren, 510
Burner, Sugg's Lantern with "London" Argand Governor, 142
Bushtiehrad Coal Mines, Double-Acting Pumping Engine at the, 154, 155, 158
Butter Kegs, Allen Ransome and Company's Machinery for Making, 552, 553

Cabany and Company's Steam Carriage (Belpaire's System); The Paris Exhibition, 272
Caillard Brothers' Steam Crane; The Paris Exhibition, 123
Cambridge Engine, 1847, 549
Canal, The Panama Ship, Projects for, 517
Cannon, The Hotchkiss Revolving, 4, 5, 25, 63
Carbon Telephone, Edison's, 488
Carbon Transmitter, Edison's New, 489
Carnaire and Montellier's Vertical Tubular Boiler, 284
Carriage, Composite, for the Western Railway of France; The Paris Exhibition, 433
Carriage, First-Class, Iron Frame for; Southern Railway of France; The Paris Exhibition, 231
Carriage, First-Class; Western Railway of France, 241
Carriage Saloon for the Southern Railway of France; The Paris Exhibition, 230
Carriage, Steam, for the Belgian State Railway; The Paris Exhibition, 214
Carriage Wheels, Apparatus for Balancing; The Paris Exhibition, 110
Carriages, Railway, The Westinghouse Light for, 264
Central Africa, Future Trade in, 311
Centrifugal Pump, J. and H. Gwynne's, 569
Chemical Composition and Physical Properties of Steel Rails, The, 185
Chiswick Main Drainage Works, Hathorn and Davey's Pumping Engines at the, 476, 477, 478
Chlorides, Spectrographs of, 429
Circle, Boucher's Calculating, 498
Circuits, Telephone, Induction in, 277
Circumference of the Circle, The, 136, 193
Civil Engineering at the Paris Exhibition, 316, 433
Claparède and Company's Firebox of Goods Locomotive (Ten-Brink System) for the Paris and Orleans Railway; The Paris Exhibition, 455
Claparède and Company's Goods Locomotive for the Paris and Orleans Railway; The Paris Exhibition, 454
Clark, Standfield, and Company's Depositing Floating Dock, The Nicolaieff, 26
Clark and Standfield's Hydraulic Grid, 202
Clayton and Shuttleworth's 4-Horse Portable Engine, 1853, 560
Clayton and Shuttleworth's Straw Burning Portable Engine, 572
Clayton and Shuttleworth's Thrashing Machine, with Side Feed, 556
Clerac's Electric Vote Recorder, 112
Clerk's Gas Engine, 550
Cleveland Iron, The Phosphorus in; Diagram, 448
Clover Cutter, 1807, Plucknett's, 545
Clutch, Pfleiderer's Friction, 243
Coal Mines, The Dombrowa, Plan of, 227
Coal Mining at the Paris Exhibition, 36, 367
Coal Wagon; The Paris Exhibition, 47
Coalfields, Plan of the Donetz; Mineral Wealth of European Russia, 169
Cochran's Boiler and Engine, 576
Collier and Company's Wheel Centre and Tyre Boring Lathe, 361
Collieries, Blantyre, Stevenson's Mine Ventilator at the, 177
Colliery Company, The Epinac; The Paris Exhibition, 367
Combination Pan, The Wheeler and Patton; Pan Amalgamation of Silver Ores, 191
Comet Pump for the Yacht "Wanderer," 568
Commutator, Lartigue's Mercury, 273
Composite Carriage for the Western Railway of France; The Paris Exhibition, 433
Compound Beam Engine, Thomas and Powell's; The Paris Exhibition, 50
Compound Engine, Simpson and Company's Horizontal, 432
Compound Engine, Willan's, 577
Compound Horizontal Engine, at the Pester Walzmühle, Buda-Pesth, 290, 291
Compound Locomotive, Details of Mallet's; The Paris Exhibition, 516
Compound Reversing Rolling Mill Engines, Miller and Company's, 277
Compound Semi-Portable Engine, J. Fowler and Company's, 560
Consolidated Virginia Mills, Ore Bins at the; Pan Amalgamation of Silver Ores, 134, 135
Construction of Yachts, The; Lloyd's Register, 356
Continuous Brakes; Diagrams, 383
Cooper, Hewitt, and Company's Works; American Iron and Steel Works, 88, 150, 151
Courtenay's Self-Acting Syren Buoy, 510
Cowper's Writing Telegraph, 180, 181
Crane, Caillard Brothers' Steam; The Paris Exhibition, 123
Crane, Travelling, Watson's Gap Lathe with, 154
Cranes for Tweddell's Rivetters; The Paris Exhibition, 66
Crankshafts, Strains on, 348, 349, 350
Crookes's Apparatus at the Royal Society Soirée, 398, 399, 400
Crown Telephone, The, 489
Current Balance, Professor Hughes's Induction, 218, 219, 458, 486
Currents, Electric, Siemens' Regulator for, 162, 163
Cutting Deals, Furness and Company's Band Saws for, 235
Cyprus Thrashing Machine, 538

Deadweight Safety Valve, Eave's, 466
Deals, Furness and Company's Band Saws for Cutting, 235
Dean's Engine, 1844, 548, 549
Deep-Sea Recording Thermometer, Negretti and Zambra's; The Paris Exhibition, 97

Derailed Rolling Stock, Apparatus for Replacing; The Paris Exhibition, 459
Dimensions, Standard, for Machine Fitting, 407
Dioptric Light for Lightships; Sautter, Lemonnier, and Company's; The Paris Exhibition, 210, 211
Dioptric Revolving Lantern, Sautter, Lemonnier, and Company's Electric; The Paris Exhibition, 269
Distribution of Load upon the Axles of Tank Engines, The, 441
Dock, Clark, Standfield, and Company's Nicolaieff Depositing Floating, 28
Dock, Molk and Nisbet's Ayr, 342
Docks, Floating, 382, 383
Dolly Tub, or Agitator; Pan Amalgamation of Silver Ores, 473
Dombrowa Coal Mines, Plan of the, 227
Donetz Coalfields, Plan of the; Mineral Wealth of European Russia, 169
Double-Acting Pumping Engine at the Bushtiehrad Coal Mines, 154, 155, 156
Double-Check Pressure Gauge, Stewart's, 37
Double-Crown Telephone, The, 489
Douglas and Grant's Three-Cylinder Compound Engines of the Yacht "Isa," 194, 195
Drainage of Lake Fucino, The, 249, 250, 252
Dredging Plant, Hersent and Langlois', at the Toulon Docks; The Paris Exhibition, 432
Drilling Machine, Tweedy's Boiler, 340
Drum Guard for Thrashing Machine, Marshall, Sons, and Company's, 580
Dumpy Level, The, 49
Duplex Gauges, 100
Durable Spur Wheel, A, 122
Durham Iron Works, Pennsylvania, U.S.A., Blast Furnace at the; American Iron and Steel Works, 150
Durham Iron Works, Pennsylvania, U.S.A., Blast-Heating Stoves at the; American Iron and Steel Works, 151

Eave's Deadweight Safety Valve, 466
Edison's Carbon Telephone, 488
Edison's Electro-Chemical Telephone, 238, 239
Edison's Moist Paper Telephone, 488
Edison's New Carbon Transmitter, 489
Effect of Brakes on Railway Trains, The, 374
Effects of Shot and Shell on Armour Plates, The, 70, 71
Electric Currents, Siemens' Regulator for, 162, 163
Electric Light Apparatus, Marshall, Sons, and Company's Portable, 364
Electric Light, The Rapieff, 51
Electric Light, Travelling, for Railways, Ransomes, Sims, and Head's, 16
Electric Light, The Wallace-Farmer, 310
Electric Lighting, 403
Electric Vote Recorder, Clerac's, 112
Electrical Induction, Sonometry by, 419
Electricity, Lighting by, 513
Electro-Chemical Telephone, Edison's, 238, 239
Electro-Magnetic Receiver, Gray's, 488
Engine, Auxiliary Pumping, with "Comet" Pumps, for the Yacht "Wanderer," Balfour and Company's, 568
Engine and Boiler, Cochran's, 576
Engine, 1847, Cambridge, 549
Engine, 1853, Clayton and Shuttleworth's 4-Horse Portable, 560
Engine, Clayton and Shuttleworth's Portable Straw-Burning, 573
Engine, Clerk's Gas, 580
Engines, Compound Horizontal, at Pester Walzmühle, Buda-Pesth, 290, 291
Engine, 1844, Dean's, 548, 549
Engine, Double-Acting Pumping, at the Bushtiehrad Coal Mines, 154, 155, 156
Engine, J. Fowler and Company's Compound Semi-Portable, 560
Engine, Garrett and Sons' Portable Mining, 573
Engine, Gas, 16-Horse Otto Silent, 565
Engine, Halpin's Horizontal, with Automatic Expansion Gear, 480
Engine, The Heslop, a Chapter in the History of the Steam Engine, 101
Engines, The Porter-Allen, at the Albany and Rensselaer Iron and Steel Company's Works, U.S.A., 107, 116
Engine, Shanks and Sons' Horizontal, 561
Engine, Simpson and Company's Compound Horizontal, 422
Engine, Thomas and Powell's Compound Beam; The Paris Exhibition, 50
Engine and Thrashing Machine, 1841, Ransome's, 549
Engine, 1811, Trevithick's High-Pressure, 548
Engine, 1842, Tuxford's, 549
Engine, Under-Gear for 8-Horse Portable, 577
Engine, Vosper's Four-Cylinder, 569
Engine, Walschaerts' Horizontal; The Paris Exhibition, 29
Engine, Willan's Compound, 577
Engine, 1849, Willis's Farmer's, 558
Engineering, Civil, at the Paris Exhibition, 316, 432
Engines, Douglas and Grant's Three-Cylinder Compound, of the Yacht "Isa," 194, 195
Engines, Miller and Company's Compound Reversing Rolling Mill, 277
Engines, Pumping, at the Chiswick Main Drainage Works, Hathorn and Davey's, 476, 477, 478
Engines, Pumping, for the Water Works at Lawrence, Mass., Trial of the, 58, 59, 78, 79
Engines, Tank, The Distribution of Load upon the Axles of, 441
Epinac Colliery Company, The; The Paris Exhibition, 367
Escher, Wyss, and Company's Boiler with Ten-Brink Firegrate; The Paris Exhibition, 437
European Russia, The Mineral Wealth of, 89, 169, 227, 481
Examination of Vowel Sounds, Synthetic, Apparatus for, 199, 201, 202
Exhibition, The Paris:
Bevel Gear Cutting Machine, Fetu and Deliège's, 135
Boiler, Carnaire and Montellier's Vertical Tubular, 394
Boiler with Ten-Brink Firegrate, Escher, Wyss, and Company's, 437
Coal Mining:
Epinac Colliery Company (Saône-et-Loire), 367
Inclined Planes at the Grand' Combe Mines, Gard, France, 36
Crane, Calliard Brothers' Steam, 123
Cranes for Tweddell's Hydraulic Rivetters, 66
Derailed Rolling Stock, Apparatus for Replacing; Northern Railway of France, 459
Dredging Plant, Hersent and Langlois', at the Toulon Graving Docks, 432
Engine, Thomas and Powell's Compound Beam, 50
Engine, Walschaerts' Horizontal, 29
Firebox (Ten-Brink System) of Goods Locomotive, Claparéde and Company's, for the Paris and Orleans Railway, 455
Locomotives:
Locomotive, Claparéde and Company's Goods, for the Paris and Orleans Railway, 454
Locomotive, Details of Mallet's Compound, 516
Locomotive, Forquenot's Express, for the Paris and Orleans Railway, 390
Locomotive, Passenger, for the Belgian State Railways, 172, 173, 174
Locomotive for Rack-Rail Railways, 130, 131
Locomotive, Tank, for the Central Railway of Belgium, 272
Locomotive, Tramway, Merryweather and Sons', 256
Mazza Injector and Feed-Heating Apparatus for Locomotives, The, 24
Steam Carriage for the Belgian State Railways, 214
Steam Carriage (Belpaire's System), Armand, Cabany, and Company's, 272
Physical Science:
Deep-Sea Recording Thermometer, Negretti and Zambra's, 97
Dioptric Light for Lightships, Sautter, Lemonnier, and Company's, 210, 211
Dioptric Revolving Apparatus and Lantern, Sautter and Company's Electric, 269
Meteorological Instruments, 7, 8, 97
Thecrell's Printing Metecrograph, 7, 8
Ploughs, Ransomes, Sims, and Head's Single and Four-Furrow, 436
Railway Rolling Stock:
Carriage Wheels, Apparatus for Balancing, 110
Coal Wagon, 47
Composite Carriage for the Western Railway of France, 433
First-Class Carriage, Chevalier's, 46
Heating Footwarmers, Arrangements for, 111
Iron Frame for First-Class Carriage; Southern Railway of France, 331
Saloon Carriage, Marie's, 46
Saloon Carriage; Southern Railway of France, 330
Testing Lubricants, Apparatus for, 110
Tyres, Apparatus for Testing; Western Railway of France, 494, 495
Shears, Tweddell's Hydraulic, for Bars and Rails, 67
Therapeutic Machinery, Goransson and Company's, 215
Viaduct over the River Rance; Western Railway of France, 431, 499
Expansion Gear, Automatic, Halpin's Horizontal Engine with, 480
Explosions, Boiler, in 1878; E. B. Marten's Annual Report, 176
Express Locomotive, Forquenot's, for the Paris and Orleans Railway; The Paris Exhibition, 390

Farmer's Engine, 1849, Willis's, 558
Feed-Heating Apparatus and Injector for Locomotive, The Mazza; The Paris Exhibition, 24
Fetu and Deliège's Bevel Gear-Cutting Machine; The Paris Exhibition, 135
Field Gun, The Hotchkiss Revolving, 25
Firebox Stays, Stephenson's Locomotive, 223
Firebox (Ten-Brink System) of Goods Locomotive, Claparéde and Company's, for the Paris and Orleans Railway; The Paris Exhibition, 455
Firegrate, Ten-Brink, Escher, Wyss, and Company's Boiler with, at the Paris Exhibition, 437
Firegrates for Unbroken and Chopped Straw, Garrett and Sons', 573
First-Class Carriage, Iron Frame for; Southern Railway of France; The Paris Exhibition, 331
First-Class Carriage; Western Railway of France, 341
First-Class Railway Carriage; The Paris Exhibition, 46
Floating Dock, The Nicolaieff Depositing, Clark, Standfield, and Company's, 28
Floating Docks, 382, 383
Flow of Water through Orifices in Thin Plates, 35
Footwarmers, Arrangements for Heating; The Paris Exhibition, 111
Forms of Microphone Receivers, Simple, 283
Forquenot's Express Locomotive for the Paris and Orleans Railway; The Paris Exhibition, 390
Four-Cylinder Engine, Vosper's, 569
Four-Furrow and Single Ploughs, Ransomes, Sims, and Head's, at the Paris Exhibition, 436
Fowler and Company's Compound Semi-Portable Engine, 560
Fractures in Steel Plates for Boiler Making; Diagrams, 415
Friction Clutch, Pfeiderer's, 243
Frictional Resistances of Rolling Mills, 147
Fucino, Lake, The Drainage of, 249, 250, 252
Fuller's Spiral Rule, 257
Furnace, Blast, at the Durham Iron Works, Pennsylvania, U.S.A.; American Iron and Steel Works, 150
Furness and Company's Band Saws for Cutting Deals, 235

Gap Lathe with Travelling Crane, Watson's, 154
Garrett's Reaper, 1851, 545
Garrett and Sons' Firegrates for Unbroken and Chopped Straw, 573
Garrett and Sons' Portable Mining Engine, 573
Garrett and Sons' Thrashing Machine, 541
Gas Engine, Clerk's, 580
Gas Engine, Otto 16-Horse Silent, 565
"Gauge" or "Machine" Grinding, 187
Gauge, Stewart's Double-Check Pressure, 37
Gauges, Duplex, 100
Gear-Cutting Machine, Bevel, Fetu and Deliège's; The Paris Exhibition, 135
Gear, Nelson's Steam Steering, 253
Gear, Trappen's Valve, 520, 521, 522
Generator, Steam, The Herreshoff, 122
Gladstone's Reapers, 1806, 544, 545
Goods Locomotive, Claparéde and Company's, for the Paris and Orleans Railway; The Paris Exhibition, 454
Goods Locomotive Firebox (Ten-Brink System), Claparéde and Company's, for the Paris and Orleans Railway; The Paris Exhibition, 455
Goransson and Company's Therapeutic Machinery; The Paris Exhibition, 215
Gower Telephone, The, 387
Grand' Combe Mines, Gard, France, The Inclined Planes at the; The Paris Exhibition, 36
Gray's Electro-Magnetic Receiver, 488
Gray's Liquid Telephone, 488
Gray's Physiological Telephone, 489
Graving Docks, Toulon, Hersent and Langlois' Dredging Plant for, at the; The Paris Exhibition, 432
Greenwood and Batley's Universal Milling Machine, 375
Grid, Hydraulic, Clark and Standfield's, 203
Grinding Maize, Ransomes, Sims, and Head's Mill for, 319
Grinding Processes, 187, 207
Gun, The Hotchkiss Revolving, 4, 5, 25, 63
Gun, The 38-Ton, on Board H.M.S. "Thunderer," 139
Gwynne's Centrifugal Pump, 569

Halpin's Horizontal Engine with Automatic Expansion Gear, 480
Harrow, Old Reversible Norwegian, 533
Hathorn and Davey's Pumping Engines at the Chiswick Main Drainage Works, 476, 477, 478
Heating Footwarmers, Arrangements for; The Paris Exhibition, 111
H.M.S. "Iris," The Steam Trials of, 330, 331, 342
H.M.S. "Iris," Structural Arrangements and Proportions of, 302, 303, 306
H.M.S. "Thunderer," The 38-Ton Gun on Board, 139
Herreshoff Steam Generator, The, 122
Herreshoff Torpedo Launch, The, 93, 94, 122
Hersent and Langlois' Dredging Plant for the Toulon Graving Docks; The Paris Exhibition, 432
Heslop Engine, The, a Chapter in the History of the Steam Engine, 101
High-Level Bridge over the Thames, Sedley's Proposed, 411, 416
High-Pressure Engine, 1811, Trevithick's, 548
High-Pressure Marine Boiler, Boyer's, 410
History of the Screw Propeller, The, 13, 48
Horizontal Compound Engine, at the Pester Walzmühle, Buda-Pesth, 290, 291
Horizontal Compound Engine, Simpson and Company's, 422
Horizontal Engine, Halpin's, with Automatic Expansion Gear, 480
Horizontal Engine, Shanks and Sons', 561
Horizontal Engine, Walschaerts'; The Paris Exhibition, 29
Horn Pan, The; Pan Amalgamation of Silver Ores, 191
Horse Rollers, Old, 533
Hotchkiss Revolving Cannon, The, 4, 5, 25, 63
Hughes's Induction Balance, 218, 219, 458, 486
Hydraulic Grid, Clark and Standfield's, 203
Hydraulic Shears, Tweddell's, for Bars and Rails; The Paris Exhibition, 67

Improvements in Telephones, Recent, 387
Inclined Plane between Lyons and St. Just, 292, 294
Inclined Planes at the Grand' Combe Mines, Gard, France; The Paris Exhibition, 36
Induction Balance, Professor Hughes's, 218, 219, 458, 486
Induction, Electrical, Sonometry by, 419
Induction on Telegraph Lines, 280, 281
Induction in Telephone Circuits, 277
Indus General Steam Navigation Company's Steamer "Tezpore," The, 276
Ingot Mould, Cast-Iron; Pan Amalgamation of Silver Ores, 491
Injector and Feed Heating Apparatus, for Locomotives, The Mazza; The Paris Exhibition, 24
"Iris," H.M.S., The Steam Trials of, 330, 331, 342
"Iris," H.M.S., Structural Arrangements and Proportions of, 302, 303, 306
Iron Company, The Meier, Works of the; American Iron and Steel Works, 315, 318
Iron Frame for First-Class Carriage; Southern Railway of France; The Paris Exhibition, 331
Iron and Mild Steel, The Mechanical Properties of, 394, 395, 434, 435, 510
Iron Mills, The Union, Pittsburgh, Pa., American Iron and Steel Works, 21
Iron and Steel Institute, The, 448
Iron and Steel, The Application of the Spectroscope to the Analysis of the, 127, 429, 430, 431
Iron and Steel Boilers, 527, 528, 529, 581
Iron and Steel Works, American:
Blast Furnace at the Durham Iron Works, Pennsylvania, U.S.A., 150
Blast-Heating Stoves at the Durham Iron Works, Pennsylvania, U.S.A., 151
Rolling Mills of the New Jersey Steel and Iron Company, Trenton, U.S.A., 88
Salisbury Iron and the Works of the Barnum Richardson Company, 451
Union Iron Mills, Pittsburgh, Pa., The, 21
Works of the Meier Iron Company, The, 315, 318
Works of Messrs. Cooper, Hewitt, and Company, 88, 150, 151
"Isa," Yacht, Douglas and Grant's Three-Cylinder Compound Engines of the, 194, 195

Kegs, Butter, Allen Ransome and Company's Machinery for Making, 552, 553
Kitson's Bearing for Loose Pulleys, 243

Lake Fucino, The Drainage of, 249, 250, 252
Lambrigot's Sixpenny Phonograph, 327
Lamps, Safety, 423
Lantern, Sautter, Lemonnier, and Company's Dioptric Revolving, Electric; The Paris Exhibition, 269
Lantern, Sugg's, with "London" Argand Governor Burner, 142
Lartigue's Mercury Commutator, 273
Lathe, Collier and Company's Wheel Centre and Tyre Boring, 361
Lathe, Gap, with Travelling Crane, Watson's, 154
Lathe, Tyre-Grinding, at the Austrian State Railway Works, 391
Launch, The Herreshoff Torpedo, 93, 94, 122,
Le Grand and Sutcliff's Tubular Piles, 223
Lee's Thrashing Machine, 537
Level, The Dumpy, 49
Lever Anchor, Savage's Automatic, 572
Light Apparatus, Marshall, Sons, and Company's Portable Electric, 364
Light for Lightships, Sautter, Lemonnier, and Company's Dioptric; The Paris Exhibition, 210, 211
Light for Railway Carriages, The Westinghouse, 264
Light, The Rapieff Electric, 51
Light, Travelling Electric, for Railways, Ransomes, Sims, and Head's, 16
Light, The Wallace-Farmer Electric, 310
Lighthouse Appliances; The Paris Exhibition, 210, 211, 269
Lighting, Electric, 403
Lighting by Electricity, 513
Lines, Telegraph, Induction on, 280, 281
Liquid Telephone, Gray's, 488
Load upon the Axles of Tank Engines, The Distribution of, 441
Locomotive, Bagnall's Tank, for the Wotton Tramway, 17
Locomotive Boiler, Verderber's, 114
Locomotive, Claparéde and Company's Firebox of Goods (Ten-Brink System), for the Paris and Orleans Railway; The Paris Exhibition, 455
Locomotive, Claparéde and Company's Goods, for the Paris and Orleans Railway; The Paris Exhibition, 454
Locomotive Firebox Stays, Stephenson's, 223
Locomotive, Forquenot's Express, for the Paris and Orleans Railway; The Paris Exhibition, 390
Locomotive, Mallet's Compound, Details of; The Paris Exhibition, 516
Locomotive, Merryweather and Sons' Tramway; The Paris Exhibition, 256
Locomotive, Passenger, for the Belgian State Railways; The Paris Exhibition, 172, 173, 174
Locomotive for Rack-Rail Railways; The Paris Exhibition, 130, 131
Locomotive, Tank, for the Central Railway of Belgium, 272
Locomotives at the Paris Exhibition, 24, 130, 131, 172, 173, 174, 214, 256, 272, 390, 454, 455, 516
"London" Argand Governor Burner, Sugg's Lantern with, 142
Loose Pulleys, Kitson's Bearing for, 243
Lubricants, Apparatus for Testing; The Paris Exhibition, 110
Lubricants, Machine for Testing; Eastern Railway of France, 234, 235
Lyons and St. Just Railway, Incline between, 292, 294
Lysedal, Norway, Pihl's Viaduct over the, 1, 2, 9

Machine, Asquith's Slotting, 257
Machine, Fetu and Deliège's Bevel Gear-Cutting; The Paris Exhibition, 135
Machine Fitting, Standard Sizes for, 407
"Machine" or "Gauge" Grinding, 187
Machine, Greenwood and Batley's Universal Milling, 375
Machine, Old Winnowing, 536
Machine, Richards and Atkinson's Multiple Wood-Boring, 506
Machine, Sharp, Stewart, and Company's Shaping, 444
Machine for Testing Lubricants; Eastern Railway of France, 234, 235
Machine, Thrashing, Ransomes, Sims, and Head's, for Hot Climates, 322, 323

Machine, Tweedy's Boiler Drilling, 340
Machine-Worked Punkahs, 285
Machinery, Goransson and Company's Therapeutic; The Paris Exhibition, 215
Machinery for Making Butter Kegs, Allen Ransome and Company's, 552, 553
Magneto-Electric Machines; Lighting by Electricity, 513
Main Drainage Works, Chiswick, Hathorn and Davey's Pumping Engines at the, 476, 477, 478
Mallet's Compound Locomotive, Details of; The Paris Exhibition, 516
Mann's Reaper, 1820, 545
Map of the Mineral Wealth of European Russia, 89
Marie's Saloon Carriage; The Paris Exhibition, 46
Marine Boiler, Boyer's High-Pressure, 410
Marshall, Sons, and Company's Portable Electric Light Apparatus, 364
Marshall, Sons, and Company's Thrashing Machine Drum Guard, 580
Marten's Annual Report of Boiler Explosions in 1878, 176
Mazza Injector and Feed Heating Apparatus for Locomotives; The Paris Exhibition, 24
Meare's Reaper, 1800, 544
Mechanical Properties of Iron and Mild Steel, The, 394, 395, 434, 435, 510
Mechanical Shipbuilding, 356
Meier Iron Company, Works of the; American Iron and Steel Works, 315, 318
Meik and Nisbet's Ayr Dock, 242
Meikle's Thrashing Machine, 536
Mercury, Arrangement for Moving Mechanically; Pan Amalgamation of Silver Ores, 491
Mercury Commutator, Lartigue's, 273
Merryweather and Sons' Tramway Locomotive; The Paris Exhibition, 256
Meteorograph, Theorell's Printing; The Paris Exhibition, 7, 8,
Meteorological Instruments at the Paris Exhibition, 7, 8, 97
Microphone Receivers, Simple Forms of, 289
Mild Steel and Iron, 394, 395, 434, 435
Mill for Grinding Maize, Ransomes, Sims, and Head's, 319
Miller and Company's Compound Reversing Rolling Mill Engines, 277
Milling Machine, Greenwood and Batley's Universal, 375
Mills, Ore Bins at the Consolidated Virginia; Pan Amalgamation of Silver Ores, 134, 135
Mills, Rolling, of the New Jersey Steel and Iron Company, Trenton, U.S.A.; American Iron and Steel Works, 88
Mine Ventilator, Stevenson's, at the High Blantyre Collieries, 177
Mineral Waters, The Bourboule and Royat, 337
Mineral Wealth of European Russia, The, 89, 169, 227, 491
Mining, Coal, at the Paris Exhibition, 36, 367
Mining Engine, Garrett and Sons' Portable, 573
Moist Paper Telephone, Edison's, 488
Multiple Wood-Boring Machine; Richards and Atkinson's, 506

Nalder and Nalder's Combined Thrashing Machine and Straw Elevator, 540, 541
Negretti and Zambra's Deep-Sea Recording Thermometer; The Paris Exhibition, 97
Nelson's Steam Steering Gear, 253
New Jersey Steel and Iron Company, Trenton, U.S.A., Rolling Mills of the, 88
Nicolaieff Depositing Floating Dock, Clark, Standfield, and Company's, 28
Norwegian Harrow, Old Reversible, 533

Ogle's Reaper, 1822, 545
Onions's Thrashing Machine, 537
Orange River, Bridge over the, at Bethalie, Cape of Good Hope, 371
Ore Bins at the Consolidated Virginia Mills; Pan Amalgamation of Silver Ores, 134, 135
Orifices in Thin Plates, The Flow of Water through, 35
Oscillometer, The, 406
Otto Silent Gas Engine, 16-Horse, 565

Pan Amalgamation of Silver Ores in Nevada and Colorado, 43, 128, 134, 135, 190, 191, 370, 473, 491, 493
Pan, The Horn; Pan Amalgamation of Silver Ores, 191
Pan, The Patton; Pan Amalgamation of Silver Ores, 191
Pan and Settler Frames; Pan Amalgamation of Silver Ores, 370
Pan, The Stevenson; Pan Amalgamation of Silver Ores, 191
Pan, The Varney; Pan Amalgamation of Silver Ores, 190
Pan, The Wheeler; Pan Amalgamation of Silver Ores, 190
Pan, The Wheeler and Patton Combination; Pan Amalgamation of Silver Ores, 191
Panama Ship Canal, Projects for the, 517
Paris Exhibition, The (*See Exhibition, The Paris*)
Paris and Orleans Railway, Claparéds and Company's Goods Locomotive for the; The Paris Exhibition, 454
Paris and Orleans Railway, Forquenot's Express Locomotive for the; The Paris Exhibition, 390
Passenger Locomotive for the Belgian State Railways; The Paris Exhibition, 172, 173, 174
Permanent Way of Tramways, The, 265, 322, 435
Pester Walzmühle, Buda-Pesth, Compound Horizontal Engine at the, 290, 291
Pfeiderer's Friction Clutch, 243
Phelps's Telephone, 489
Phonograph, A Sixpenny, 327
Phosphorus in Cleveland Iron, The; Diagram, 448
Physical Properties and Chemical Composition of Steel Rails, The, 185
Physical Science at the Paris Exhibition, 7, 8, 97, 210, 211, 269
Physiological Telephone, Gray's, 489
Pihl's Viaduct over the Lysedal, Norway, 1, 2, 9
Piles, Le Grand and Sutcliff's Tubular, 223
Pitt's Reaper, 1786, 544
Plane, Inclined, between Lyons and St. Just, 292, 294
Planes, Inclined, at the Grand' Combe Mines, Gard, France; The Paris Exhibition, 36
Plates, Armour, The Effects of Shot and Shell on, 70, 71
Ploughs, Ransomes, Sims, and Head's Single and Four-Furrow, at the Paris Exhibition, 436
Plucknett's Reapers, 1805, 544, 545
Poole System of Grinding, The, 207,
Portable Electric Light Apparatus, Marshall, Sons, and Company's, 364
Porter-Allen Engine, The, at the Albany and Rennselaer Iron and Steel Company's Works, U.S.A., 107, 115
Pressure Gauge, Stewart's Double-Check, 37
Priming, 100
Printing Meteorograph, Theorell's; The Paris Exhibition, 7, 8
Professor Hughes's Induction Balance, 218, 219, 458, 486
Projectile, A Winged, 235
Propeller, The Screw, 352, 353
Propeller, Screw, A Contribution to the History of the, 13
Propeller, Screw, History of the, 48
Propulsion, Twin-Ship, 334, 335
Pulleys, Loose, Kitson's Bearing for, 243
Pulp and Slime Vat Building; Pan Amalgamation of Silver Ores, 370
Pump, J. and H. Gwynne's Centrifugal, 569
Pumping Engine, Auxiliary, with "Comet" Pumps, for the Yacht "Wanderer," Balfour and Company's, 568
Pumping Engine, Double-Acting, at the Bushtiehrad Coal Mines, 154, 155, 158
Pumping Engines at the Chiswick Main Drainage Works, Hathorn and Davey's, 476, 477, 478
Pumping Engines for the Water Works at Lawrence, Massachusetts, Trial of the, 58, 59, 78, 79
Punkahs, Machine-Worked, 285

Rack-Rail Railways, Locomotive for; The Paris Exhibition, 130, 131
Rail, Bessemer Steel, Twisted Cold, 414
Rails and Bars, Tweddell's Hydraulic Shears for; The Paris Exhibition, 67
Rails, Steel, The Chemical Composition and Physical Properties of, 185
Rails, Steel; Report of T. N. Ely, 143, 144, 166, 185
Railway Carriages, The Westinghouse Light for, 264
Railway Incline between Lyons and St. Just, 292, 294
Railway Rolling Stock at the Paris Exhibition, 46, 47, 110, 111, 230, 231, 433, 494, 495
Railway Trains, The Effects of Brakes on, 374
Ransome, A., and Company's, Machinery for Making Butter Kegs, 552, 553
Ransome's Engine and Thrashing Machine, 1841, 549
Ransome's Thrashing Machine, 1843, 537
Ransomes, Sims, and Head's Mill for Grinding Maize, 319
Ransomes, Sims, and Head's Single and Four-Furrow Ploughs at the Paris Exhibition, 436
Ransomes, Sims, and Head's Thrashing Machine for Hot Climates, 322, 323
Ransomes, Sims, and Head's Travelling Electric Light for Railways, 16
Rapieff Electric Light, The, 51
REAPING MACHINES:
Bailey's, 1822, 545
Bell's, 1826, 545
Garrett's, 1851, 545
Gladstone's, 1806, 544
Gladstone's, 1826, 545
Mann's, 1820, 545
Meare's, 1800, 544
Ogle's, 1822, 545
Pitt's, 1786, 544
Plucknett's, 1805, 544
Plucknett's, 1807, 544
Roman, 538
Salmon's, 1807, 544
Smith's, 1811, 544
Springer's, 1839, 554
Walker's, 1799, 544
Recent Improvements in Telephones, 387
Receiver, Gray's Electro-Magnetic, 488
Receivers, Microphone, Simple Forms of, 289
Regulator for Electric Currents, Siemens', 162, 163
Reis's Telephone, 467
Replacing Derailed Rolling Stock, Apparatus for; The Paris Exhibition, 459
Report, Annual, of Mr. E. B. Marten, on Boiler Explosions, 176
Retort for Amalgam; Pan Amalgamation of Silver Ores, 491
Reversible Old Norwegian Harrow, 533
Revolving Cannon, The Hotchkiss, 4, 5, 25, 63
Richards and Atkinson's Multiple Wood-Boring Machine, 506
River Bars, The Removal of, by Induced Tidal Scour, 108, 474
River Lysedal, Norway, Pihl's Viaduct over the, 1, 2, 9
River Orange, Bridge over the, at Bethalie, Cape of Good Hope, 371
River Rance, Viaduct over the; The Paris Exhibition, 481, 499
River Thames, Sedley's Proposed High-Level Bridge over the, 411, 416
Rivetters, Crane for Tweddell's Hydraulic; The Paris Exhibition, 66
Road Boiler, Aveling and Porter's Steam, 564
Rollers, Old Horse, 533
Rolling Mill Engines, Miller and Company's Compound Reversing, 277
Rolling Mills, Frictional Resistances of, 147
Rolling Mills of the New Jersey Steel and Iron Company, Trenton, U.S.A.; American Iron and Steel Works, 88
Rolling Stock, Apparatus for Replacing Derailed: The Paris Exhibition, 459
Roman Reaper, 538
Roof Trusses, Strains on, 266
Royal Society Soirée, The, 398, 399, 400
Royat and Bourboule Mineral Waters, The, 337
Rubbing Mill, Winslaw's, 535
Rule, Fuller's Spiral, 257
Russia, European, The Mineral Wealth of, 89, 169, 227, 491

Safety Lamps, 423
Safety Valve, Eave's Deadweight, 466
Salisbury Iron and the Works of the Barnum Richardson Company; American Iron and Steel Works, 451
Salmon's Reaper, 1807, 544
Saloon Carriage, Marie's; The Paris Exhibition, 46
Saloon Carriage for the Southern Railway of France; The Paris Exhibition, 230
Sandringham Water Supply, The, 91, 92
Sautter, Lemonnier, and Company's Dioptric Light for Lightships; The Paris Exhibition, 210 211
Sautter Lemonnier, and Company's Dioptric Revolving Lantern, Electric; The Paris Exhibition, 269
Savage's Automatic Lever Anchor, 572
Saws, Band, for Cutting Deals, Furness and Company's, 235
Science, Physical, at the Paris Exhibition, 7, 8, 97, 210, 211, 269
Screw Propeller, The, 352, 353
Screw Propeller, A Contribution to the History of the, 13
Screw Propeller, History of the, 48
Scour, Tidal, The Removal of River Bars by, 108, 474
Sedley's Proposed High-Level Bridge over the Thames, 411, 416
Settler; Pan Amalgamation of Silver Ores, 473
Shanks and Sons' Horizontal Engine, 561
Sharp, Stewart, and Company's Shaping Machine, 444
Shears, Tweddell's Hydraulic, for Bars and Rails; The Paris Exhibition, 67
Ship Canal, Projects for the Panama, 517
Shipbuilding, Mechanical, 356
Shot and Shell, The Effects of, on Armour Plates, 70, 71
Side-Feed Thrashing Machine, Clayton and Shuttleworth's, 556
Siemens' Regulator for Electric Currents, 162, 163
Silver Ores, Pan Amalgamation of, in Nevada and Colorado, 43, 128, 134, 135, 190, 191, 370, 473, 491, 493
Simpson and Company's Horizontal Compound Engine, 422
Simple Forms of Microphone Receivers, 289
Single and Four-Furrow Ploughs, Ransomes, Sims, and Head's, at the Paris Exhibition, 436
Sixpenny Phonograph, A, 327
Slotting Machine, Asquith's, 257
Smeaton's Portable Boiler, 1765, 548
Smith's Reaper, 1811, 544
Soirée, The Royal Society, 398, 399, 400
Sonometry by Electrical Induction, 419
Speaking Telephones, 467, 488, 489
Spectragraphs of Chlorides, 429
Spectroscope, The Application of, to the Analysis of Iron and Steel, 127, 429, 430, 431
Spiral Rule, Fuller's, 257
Springer's Reaper, 1839, 545
Spur Wheel, A Durable, 122
Standard Sizes for Machine Fitting, 407
Stannah's Stuffing Box, 223
Steam Carriage (Belpaire's System), Cabany and Company's; The Paris Exhibition, 272
Steam Carriage for the Belgian State Railways; The Paris Exhibition, 214
Steam Crane, Caillard Brothers'; The Paris Exhibition, 123
Steam Engine, A Chapter in the History of the; The Heslop Engine, 101
Steam Generator, The Herreshoff, 122
Steam Road Boiler, Aveling and Porter's, 564
Steam Trials of H.M.S. "Iris," The, 330, 331, 342
Steamer "Tsepore," The Indus General Steam Navigation Company's, 276
Steedman's Thrashing Machine, 537
Steel, Bessemer, Samples of, 414, 415
Steel and Iron Boilers, 527, 528, 529, 561
Steel, Mild, and Iron, The Mechanical Properties of, 394, 395, 434, 435, 514
Steel Plate, Bessemer, Treated Cold, 414
Steel Plates for Boiler Making, Fractures in; Diagrams, 415
Steel Rail, Bessemer, Twisted Cold, 414
Steel Rails, The Chemical Composition and Physical Properties of, 185
Steel Rails; Report of T. N. Ely, 143, 144, 166, 185
Steering Gear, Nelson's Steam, 253
Stephenson's Locomotive Firebox Stays, 223
Stevenson's Mine Ventilator at the High Blantyre Collieries, 177
Stevenson Pan, The; Pan Amalgamation of Silver Ores, 191
Stewart's Double-Check Pressure Gauge, 37
Stove, Blast Heating, at the Durham Iron Works, Pennsylvania, U.S.A.; American Iron and Steel Works, 151
Strains on Crankshafts, 348, 349, 350
Strains on Roof Trusses, 266
Straw-Burning Portable Engine, Clayton and Shuttleworth's, 572
Straw Elevator and Thrashing Machine, Combined, Nalder's, 540, 541
Structural Arrangements and Proportions of H.M.S. "Iris," 302, 303, 306
Stuffing-Box, Stannah's, 223
Sugg's Lantern with "London" Argand Governor, 142
Supplementary Water Works of Vienna, The New, 287, 288
Synthetic Examination of Vowel Sounds, Apparatus for, 199, 201, 202
Syren Buoy, Courtenay's Self-Acting, 510

Table and Box for Mercury Bags; Pan Amalgamation of Silver Ores, 473
Tank Engines, The Distribution of Load upon the Axles of, 441
Tank Locomotive, Bagnall's, for the Wotton Tramway, 17
Tank Locomotive for the Central Railway of Belgium, 272
Telegraph, Cowper's Writing, 180, 181
Telegraph Lines, Induction on, 280, 281
TELEPHONES:
Ader's, 387
Articulating, 467, 488, 489
Bell's, 498
Breguet's, 489
Circuits, Induction in, 277
Crown, 489
Double-Crown, 489
Edison's Carbon, 488
Edison's Electro-Chemical, 238, 239
Edison's Moist Paper, 488
Gower, 387
Gray's Liquid, 488
Gray's Physiological, 489
Phelps's, 489
Recent Improvements in, 387
Reis's, 467
Ten-Brink Firegrate, Escher, Wyss, and Company's Boiler with, at the Paris Exhibition, 437
Testing Lubricants, Apparatus for; The Paris Exhibition, 110
Testing Lubricants, Machine for; Eastern Railway of France, 234, 235
Testing Tyres, Apparatus for, on the Western Railway of France; the Paris Exhibition, 494, 495
"Tsepore," The Indus General Steam Navigation Company's Steamer, 276
Thames, River, Sedley's Proposed High-Level Bridge over the, 411, 416
Theorell's Printing Meteorograph; The Paris Exhibition, 7, 8
Thermometer, Deep Sea Recording, Negretti and Zambra's; The Paris Exhibition, 97
Therapeutic Machinery, Goransson and Company's; The Paris Exhibition, 215
Thirty-Eight-Ton Gun on Board H.M.S. "Thunderer," The, 139
Thomas and Powell's Compound Beam Engine; The Paris Exhibition, 50
THRASHING MACHINES:
Clayton and Shuttleworth's, with Side Feed, 556
Cyprus, 538
Garrett and Sons', 541
Lee's, 537
Marshall, Sons, and Company's Drum Guard, 580
Meikle's, 536
Nalder and Nalder's, Combined, and Straw Elevator, 540, 541
Onions's, 537
Ransome's, 537
Ransome's, and Engine, 1841, 549
Ransomes, Sims, and Head's, for Hot Climates, 322, 323
Steedman's, 537
Tuxford's, 1844, 538
Wardropp's, 536
Three-Cylinder Compound Engines of the Yacht "Isa," Douglas and Grant's, 194, 195
"Thunderer," H.M.S.; 38-Ton Gun, 139
Tidal Scour, Induced, The Removal of River Bars by, 108, 474
Torpedo Launch, The Herreshoff, 93, 94, 122
Toulon Graving Docks, Hersent and Langlois' Dredging Plant at the; The Paris Exhibition, 432
Tower, Water, The Sandringham, 91, 92
Trade in Central Africa, Future, 311
Trains, Railway, The Effect of Brakes on, 374
Tramway, Locomotive, Merryweather and Sons'; The Paris Exhibition, 256
Tramways, The Permanent Way of, 265, 322, 435
Translation, The Wave of, 344, 345
Transmitter, Carbon, Edison's New, 489
Trappen's Valve Gear, 520, 521, 522
Travelling Crane, Watson's, Gap Lathe with, 184
Travelling Electric Light for Railways, Ransomes, Sims, and Head's, 16
Travithick's High-Pressure Engine, 1811, 548
Trial of the Pumping Engines for Water Works at Lawrence, Massachusetts, 58, 59, 78, 79
Trusses, Roof, Strains on, 266
Tubular Boiler, Carnaire and Montellier's Vertical, 264
Tubular Piles, Le Grand and Sutcliff's, 223
Tunstall's Thrashing Machine, 536
Tuxford's Engine, 1842, 549
Tuxford's Thrashing Machine, 1844, 538
Tweddell's Hydraulic Rivetters, Cranes for; The Paris Exhibition, 66
Tweddell's Hydraulic Shears for Bars and Rails; The Paris Exhibition, 67
Tweedy's Boiler Drilling Machine, 340
Twin-Ship Propulsion, 334, 335
Tyre Boring and Wheel Centre Lathe, Collier and Company's, 561

Tyre-Grinding Lathe at the Austrian State Railway Works, 391
Tyres, Apparatus for Testing, on the Western Railway of France; The Paris Exhibition, 494, 495

Under-Gear for 8-Horse Portable Engine, 577
Union Iron Mills, The Pittsburgh, Pa.; American Iron and Steel Works, 21
Universal Milling Machine, Greenwood and Batley's, 375

Valve, Eave's Deadweight Safety, 468
Valve Gear, Trappen's, 820, 321, 322
Varney Pan, The; Pan Amalgamation of Silver Ores, 189
Ventilator, Stevenson's Mine, at the High Blantyre Collieries, 137
Verderber's Locomotive Boilers, 114
Vertical Tubular Boiler, Carnaire and Montellier's, 284
Viaduct over the Lysedal, Norway, 1, 2, 9
Viaduct over the River Rance; Western Railway of France; The Paris Exhibition, 481, 499
Vienna, The New Supplementary Water Works of, 287, 288
Voltaic Batteries; Lighting by Electricity, 513
Vosper's Four-Cylinder Engine, 569
Vote Recorder, Clerac's Electric, 112
Vowel Sounds, Apparatus for the Synthetic Examination of, 199, 201, 202

Walker's Reaper, 1799, 544
Wallace-Farmer Electric Light, The, 310
Walschaerts' Horizontal Engine; The Paris Exhibition, 79
"Wanderer," The Yacht, Auxiliary Pumping Engine for, 568
Wardropp's Thrashing Machine, 536
Water Supply, The Sandringham, 91, 92
Water Works at Lawrence, Massachusetts, Trial of the Pumping Engines for the, 58, 59, 75, 79
Water Works of Vienna, The New Supplementary, 287, 288
Waters, Mineral, The Bourboule and Royat, 337
Watson's Gap Lathe with Travelling Crane, 154
Wave of Translation, The, 344, 345
Way, Permanent, for Tramways, 322
Wealth, The Mineral, of European Russia, 89, 169, 227, 431
Western Railway of France, First-Class Carriage for the, 341
Westinghouse Brake, The, 85
Westinghouse Light for Railway Carriages, The, 264
Wheel Centre and Tyre Boring Lathe, Collier and Company's, 361
Wheel, Spur, A Durable, 122
Wheeler Pan, The; Pan Amalgamation of Silver Ores, 190, 191
Wheels, Carriage, Apparatus for Balancing; The Paris Exhibition, 110
Willan's Compound Engine, 577
Willis's Farmer's Engine, 1849, 553
Winged Projectile, A, 235
Winnowing Machine, Old, 536
Winslaw's Rubbing Mill, 533
Wood-Boring Machine, Richards and Atkinson's Multiple, 506
Works of the Barnum Richardson Company and Salisbury Iron, The; American Iron and Steel Works, 451
Works of Cooper, Hewitt, and Company, The; American Iron and Steel Works, 88, 150, 151
Works of the Meier Iron Company, The; American Iron and Steel Works, 315, 318
Wotton Tramway, Bagnall's Tank Locomotive for the, 17
Writing Telegraph, Cowper's, 180, 181

Yacht "Isa," Douglas and Grant's Three-Cylinder Compound Engines of the, 194, 195
Yacht "Wanderer," Auxiliary Pumping Engine for the, 568
Yachts, The Construction of; Lloyd's Register, 356

TWO-PAGE ENGRAVINGS.

APPARATUS for replacing Derailed Rolling Stock; Northern Railway of France. To adjoin page 459

Blast Furnace, Blowing Engines and Boilers, at the Works of the Meier Iron Company, U.S.A. To adjoin page 315
Bridge over the River Derwent at Derby; Great Northern Railway. To adjoin page 292

Carriage, Belpaire's Steam; Belgian State Railways. To adjoin page 210
Carriage, First-Class, for the Western Railway of France. To adjoin page 341

Dock, The Ayr [*Two Plates.*] To adjoin page 242
Dredging Plant at the Toulon Graving Docks [*Three Plates.*] To adjoin page 431

Engines, Compound Reversing Rolling Mill, at the Hallside Steel Works, Glasgow. To adjoin page 274
Engine, Horizontal Compound, by Simpson and Company. To adjoin page 472
Engine, Winding, by the Société Anonyme de Constructions Mécaniques d'Anzin. To adjoin page 178
Engine, The Porter-Allen, at the Albany and Rensselaer Iron and Steel Works, U.S.A. To adjoin page 115
Gun, Explosion of the 38-Ton, on Board H.M.S. "Thunderer." To adjoin page 257

Locomotive, Compound, for the Bayonne and Biarritz Railway. To adjoin page 517
Locomotive, Express, for the Paris and Orleans Railway. To adjoin page 289
Locomotive, Goods, with Boiler for Burning Waste Anthracite Coal; Philadelphia and Reading Railroad. To adjoin page 67
Locomotive, Passenger Tank, for the Belgian State Railways. To adjoin page 171
Rolling Mill, Universal Reversing. To adjoin page 21

Silver Ores, Plant for the Pan Amalgamation of. To adjoin page 43

Viaduct over the River Rance, near Dinan [*Two Plates.*] To adjoin page 499
Viaduct with Rocking Piers (Petersson's System) over the Lysedal, Norway. To adjoin page 1

Water Works, The Sandringham. To adjoin page 91

GENERAL INDEX.

ADDRESS of the President of the Cleveland Institution of Engineers, 18, 37
Address of the President of the Institution of Naval Architects, 283
Address of the President of the Iron and Steel Institute, Mr. Edward Williams, 400
Ader Telephone, The, 387
Africa, Central, Future Trade in, 310
African Telegraphs, South, 312
Agricultural Engines, 557
Agricultural Machinery, Progress of, 533
AGRICULTURAL SHOW, THE ROYAL, AT KILBURN: 576
Agricultural Engines, 557
Automatic Lever Anchor, Savage's, 576
Boiler and Engine, Cochran's, 573
Centrifugal Pump, J. and H. Gwynne's, 573
Drills, 554
Engines:
Clayton and Shuttleworth's Straw-Burning Portable, 570
Clerk's Gas, 574
Crossley Brothers 16-Horse Otto Silent Gas, 574
Garrett and Sons' Portable Mining, 573
Shanks and Sons' Horizontal, 571
Firegrates for Unbroken and Chopped Straw, Garrett and Sons', 572
Implements of Tillage, 534
Machinery for Making Butter Kegs, Allen Ransome and Company's, 569
Miscellaneous Implements, 534
Portable and Fixed Engines, 570
Progress of Agricultural Machinery, The, 533
Reaping Machines, 536
Royal Agricultural Society, The, 551
Steam Cultivation, 547
Steam Ploughing Machinery and Traction Engines, 575
Steam Power, 543
Steam Road Roller, Aveling and Porter's, 575
Thrashing Machine Drum Guard, Marshall, Sons, and Company's, 573
Thrashing Machine, Garrett and Sons', 573
Thrashing Machine, with Side Feed, Clayton and Shuttleworth's, 573
Thrashing Machine and Straw Elevator, Nalder and Nalder's, 577
Thrashing Machines, 535, 577
Under-Gear for 8-Horse Portable Engine, Marshall, Sons, and Company's, 570
Wood-Working Machinery, 569
Albany and Rensselaer Iron and Steel Company's Works, U.S.A., The Porter-Allen Engine at the, 115
Albert Hall, Electric Lighting at the, 400
Albo-Carbon Light, The, 157
Amalgamated Engineers, The Society of, 462
Amalgamation, Pan, of Silver Ores, in Nevada and Colorado, 44, 128, 189, 369, 473, 491, 514
American Institute of Mining Engineers (*See Engineers, The American Institute of Mining*)
American Iron and Steel Works (*See Iron and Steel Works, American*)
American Machine Tools; English Industries and American Competition, 2
American Testing Machine, An, 267
Ammunition; The Hotchkiss Revolving Cannon, 23
Analysis of Iron and Steel, The Application of the Spectroscope to the, 137, 429
Annapolis and Windsor Railway; Canadian Railways, 44
Annapolis to Yarmouth, Western Counties Railway; Canadian Railways, 108
Apparatus for Replacing Derailed Rolling Stock, at the Paris Exhibition, 459
Arctic Meteorology, 475
Armour-Plating Ships of War, 295
Armour to Resist Shot and Shell, The Construction of, 69
Armour for Ships, 300
Articulating Telephones, 467, 483, 506
Artificial Dye Products at the Paris Exhibition, 162
Asquith's Slotting Machine, 247
Austria, Mining Instruction in, 295
Austrian Mineral Products, 35
Automatic Brake, The Westinghouse, 85
Automatic Expansion Gear, Halpin's Horizontal Engine with, 481
Automatic Lever Anchor, Savage's, at the Royal Agricultural Show, Kilburn, 576
Aveling and Porter's Steam Road Roller at the Royal Agricultural Show, Kilburn, 575
Axles of Tank Engines, The Distribution of Load upon, 441
Ayr Dock, The, 196, 242

Bagnall's Tank Locomotive for the Wotton Tramway, 17
Balance, An Induction Current, 457
Balance, Induction, Professor Hughes's, 217
Balfour and Company's Auxiliary Pumping Engine with "Comet" Pumps for the Yacht "Wanderer," 574
Band Saws for Cutting Deals, Furness's, 235
Bars, River, The Removal of, by Induced Tidal Scour, 107, 474
Basic Bricks for Furnace Linings, 427
Batteries, Voltaic; Lighting by Electricity, 513
Beam Engine, Powell's Compound, at the Paris Exhibition, 51
Bearing, Kitson's Loose Pulley, 242
Belgian Locomotives at the Paris Exhibition, 156, 171, 210, 271
Bell's Telephone, 498
Bending Moments, 33
Bevel Gear-Cutting Machine, Fetu and Delège's, at the Paris Exhibition, 195
Bill Legislation, Private, 357
Bill, The New Patent, 180, 237, 417, 434
Bill, The Noxious Gases, 465
Bills, Scotch Parliamentary, 12
Blanzy Mines, The; Coal Mining at the Paris Exhibition, 38
Board of Trade *v.* Shipowners, The, 325, 358, 439
Boat, The Herreshoff Torpedo, 32, 94, 121
Boats for Torpedo Warfare, Yarrow and Company's, 156
Boiler, Boyer's High-Pressure Marine, 416
Boiler, Carnaire and Montellier's Vertical Tubular, at the Paris Exhibition, 284
Boiler-Drilling Machine, Tweedy's, 341
Boiler and Engine, Cochran's, at the Royal Agricultural Show, Kilburn, 573
Boiler Explosions, The Coltness, 479
Boiler Explosions; Letter to the Members of the House of Commons, 278
Boiler Explosions in 1878; Report of Mr. E. B. Marten, 174
Boiler Explosions, Steam; Annual Meeting of the Manchester Steam Users' Association, 258
Boiler Explosions, Steam; Mr. Bart's Motion in the House of Commons, 397
Boiler, The Herreshoff, 121
Boiler Inspection, 523
Boiler Legislation, 501
Boiler Makers and Iron Shipbuilders, The, 501
Boiler Plate Joints, Welded, 96
Boiler with Ten-Brink Firegrate, Escher, Wyss, and Company's, at the Paris Exhibition, 457
Boilers, Steel and Iron, 527, 581
Boilers, Verderber's Locomotive, 113
Boucher's Calculating Circle, 498
Bourboule and Royat Mineral Waters, The, 337
Boyer's High-Pressure Marine Boiler, 416
Brake Trials, Continuous Railway, 361
Brake, The Westinghouse, 85
Brakes, Continuous; Experiments upon the Lyons Railway, 383
Brakes, Continuous, Report of the Board of Trade on, 251
Brakes, The Effect of, upon Railway Trains, 371
Bridge over the Orange River at Bethalie, Cape of Good Hope, 371
Bridge over the River Derwent at Derby, Handyside and Company's, 292
Bridge, Sedley's Proposed High-Level, over the Thames, 416
Bridges, Movable, 214
Bridges, Steel, 393
BRITISH ASSOCIATION, THE:
On River Control and Management, by J. Clarke Hawksbaw, 60, 80
On Machine-Worked Punkahs, by the Hon. R. C. Parsons, 284
British Association of Gas Managers, Meetings of the, 505, 520
British Museum, The Electric Light in the, 197
Bronze, Manganese, 523
Bushtiehrad Coal Mines, Double-Acting Pumping Engine at the, 154
Butler Mine Fire Cut-off, The, 206
Butter Kegs, Allen Ransome and Company's Machinery for Making, at the Royal Agricultural Show, Kilburn, 569
Bye-Laws, New, of the Institution of Naval Architects, 275

Caillard Brothers' Steam Crane at the Paris Exhibition, 123
Calculating Circle, Boucher's, 498
CANADIAN RAILWAYS:
European and North American Railway, 228
Grand Trunk Railway of Canada, 270, 338, 388, 452
New Brunswick and Canada Railway, 188
Western Counties Railway. Annapolis to Yarmouth, 108
Windsor and Annapolis Railway, 44
Canal, The Proposed Panama Ship, 518
Cannon, The Revolving Hotchkiss, 3, 23, 63,
Capital, Invested; English Industries and American Competition, 317

Carnaire and Montellier's Vertical Tubular Boiler at the Paris Exhibition, 284
Carriage, First-Class, for the Western Railway of France, 341
Carriageway Pavements, 404
Central Africa, Future Trade in, 310
Centralisation of Industry; English Industries and American Competition, 170
Centrifugal Pump, Gwynne's, at the Royal Agricultural Show, Kilburn, 573
Chemistry of Puddling, The, 509
Chilian Navy, The, 483
Chiswick Main Drainage Works, Hathorn and Davey's Pumping Engines at, 478
Circuits, Telephone, Induction in; Mr. Edison's Specification, 277
Civil Engineering at the Paris Exhibition, 287, 316, 431
Clark and Standfield's Hydraulic Grid, 203
Clayton and Shuttleworth's Portable Four-Horse Engine, 1853, 461
Clayton and Shuttleworth's Straw-Burning Portable Engine, at the Royal Agricultural Show, Kilburn, 570
Clayton and Shuttleworth's Thrashing Machine with Side Feed, at the Royal Agricultural Show, Kilburn, 578
Clerac's Electric Vote Recorder, 112
Clerk's Gas Engine, at the Royal Agricultural Show, Kilburn, 574
Cleveland Institution of Engineers; Address of the President, 18, 37
Cleveland, Notes from, 9, 30, 52, 77, 99, 121, 136, 165, 183, 196, 216, 236, 263, 283, 314, 324, 343, 376, 396, 416, 436, 460, 487, 496, 536, 579
Cleveland Ores, Steel from, 377
Clutch, Pfleiderer's Friction, 243
Clyde Shipbuilding in 1878, 26, 56
Clyde, Steel Shipbuilding on the, 156
Coal; Mineral Wealth of Russia, 169, 227
Coal Mining at the Paris Exhibition, 33, 98, 367
Cochran's Boiler and Engine at the Royal Agricultural Show, Kilburn, 572
Collier and Company's Wheel Centre and Tyre-Boring Lathe, 362
Collieries, The High Blantyre, Stevenson's Mine Ventilator at, 178
Colliery Company, The Epinac (Saône-et-Loire); Coal Mining at the Paris Exhibition, 367
Collins, Mr. W. W., 241
Coltness Boiler Explosion, The, 479
Committee of the House of Lords on Tramways, Report of the, 366
Commutator, Lartigue's Mercury, 273
Companies, The London Gas, 327
Company, The Native Guano, 54
Compound Beam Engine, Powell's, at the Paris Exhibition, 51
Compound Engine, Simpson and Company's Horizontal, 422
Compound Engine, Willan's, at the Royal Agricultural Show, Kilburn, 574
Compound Engines, Douglas and Grant's Three-Cylinder, of the Yacht "Isa," 195
Compound Horizontal Engine at the Pester Walzmühle, Buda-Pesth, 290
Compound Reversing Rolling Mill Engines at the Hallside Steel Works, Glasgow, 274
Compound Semi-Portable Engine, J. Fowler and Company's, at the Royal Agricultural Show, Kilburn, 570
Conference, The International Telegraph, 485
Congress, The Paris, 118
Construction, Railway, 103
Continuous Brakes; Experiments upon the Lyons Railway, 383
Continuous Brakes, Report of the Board of Trade on, 351
Continuous Railway Brake Trials, 381
Contribution to the History of the Screw Propeller, A, 13
Control, River, 60, 80
Conversazione of the Institution of Civil Engineers, 463
Conversazione, The Royal Society, 398, 440
Conversazione of the Society of Telegraph Engineers, The, 524
Cooper, Hewitt, and Company's Works; American Iron and Steel Works, 87, 149
Cowper's Writing Telegraph, 180
Crane, Caillard Brothers' Steam, at the Paris Exhibition, 123
Crankshafts, Strains on, 349
Cultivation, Steam, at the Royal Agricultural Show, Kilburn, 547
Cunliff, Mr. Richard S., 56
Current Balance, An Induction, 457
Currents, Regulating Electric, 164
Cutting Deals, Furness's Band Saws for, 235

Deadweight Safety Valve, Eave's, 466
Deals, Furness's Band Saws for Cutting, 235
Derailed Rolling Stock, Apparatus for Replacing, at the Paris Exhibition, 459
Derwent, River, at Derby, Handyside and Company's Bridge over the, 292
Determination of Manganese, The, 508
Dimensions, Standard, for Machine Fitting, 407
Dioptric Apparatus, Lighthouse, 362
Disappearance of the Thermal Springs at Teplitz, Bohemia, 196, 240
Disposal of Sewage at Stoke-upon-Trent, 262
Distribution of Load upon the Axles of Tank Engines, The, 441
Dock, The Ayr, 196, 242
Dock Gates, 486
Dock, The Nicolaieff Floating, 29
Docks, Floating, 381
Docks, London and St. Katherine; Victoria Dock Extension, 456
Docks, The Toulon Graving; Civil Engineering at the Paris Exhibition, 287, 316, 376, 431
Double-Acting Pumping Engine at the Bushtiehrad Coal Mines, 154
Double-Check Pressure Gauge, Stewart's, 37
Douglas and Grant's Three Cylinder Compound Engines of the Yacht "Isa," 195
Drainage of Lake Fucino, The, 249
Dredging Plant at the Toulon Graving Docks, Hersent and Langlois', 136, 376, 431
Drilling Machine, Tweedy's Boiler, 341
Drills (The Progress of Agricultural Machinery), 534
Drum Guard for Thrashing Machine, Marshall, Sons, and Company's, at the Royal Agricultural Show, Kilburn, 578
Dublin Harbour, The Improvement of, 442
Durable Spur Wheel, A, 122
Dye Products, Artificial, at the Paris Exhibition, 162

Eave's Deadweight Safety Valve, 466
Economy of Railway Working, The, 124, 145, 204, 224
Edison's Electric Light Apparatus, 159
Edison's Electro-Chemical Telephone, 238
Edison's Loud-Speaking Telephone, 442
Edison's Specification; Induction in Telephone Circuits, 277
Electric Currents, Regulating, 164
Electric v. Gas Illumination, 117
Electric Illumination, The Rapieff System of, 55
Electric Light, The, 341, 417
Electric Light Apparatus, Edison's, 159
Electric Light Apparatus, Marshall, Sons, and Company's Portable, 364
Electric Light in the British Museum, The, 197
Electric Light, The; M. Cernesson's Report, 104
Electric Light, The, at the Kensington Museum, 502
Electric Light, Mr. Preece on the, 81
Electric Light, Professor Tyndall and the, 75
Electric Light, Progress of the, 181
Electric Light for Railways, Travelling, Ransomes, Sims, and Head's, 16
Electric Light, The Wallsee-Farmer, 308
Electric Lighting, 403
Electric Lighting at the Albert Hall, 400
Electric Lighting; Report of Committee of the House of Commons, 519
Electric Lighting at the Southampton Docks, 116
Electric Vote Recorder, Clerac's, 112
Electrical Induction, 212
Electrical Induction, Sonometry by, 418
Electricity, Lighting by, 513
Electro-Chemical Telephone, Edison's, 238
Elimination of Phosphorus, The, 424
Employers' Liability for Injuries to Servants, 361
Employers to Workmen, Liability of, 197
Endurance of Steel Rails, The, 243
Engelbert's Lubricator, 479
Engine, Auxiliary Pumping, with "Comet" Pumps, for the Yacht "Wanderer," 574
Engine and Boiler, Cochran's, at the Royal Agricultural Show, Kilburn, 572
Engine, Clayton and Shuttleworth's 4-Horse, 1853, 461
Engine, Clayton and Shuttleworth's Portable Straw-Burning, at Royal Agricultural Show, Kilburn, 570
Engine, Clerk's Gas, at the Royal Agricultural Show, Kilburn, 574
Engine, Compound, Horizontal, at the Pester Walzmühle, Buda-Pesth, 290
Engine, Double-Acting Pumping, at the Bushtiehrad Coal Mines, 154
Engine, J. Fowler and Company's Compound Semi-Portable, at the Royal Agricultural Show, Kilburn, 570
Engine, Garrett and Sons' Portable Mining, at the Royal Agricultural Show, Kilburn, 572
Engine, Halpin's Horizontal, with Automatic Expansion Gear, 481
Engine, The Heslop, a Chapter in the History of the Steam Engine, 101
Engine, Otto's 16-Horse Silent Gas, at the Royal Agricultural Show, Kilburn, 574
Engine, The Porter-Allen, 115
Engine, Powell's Compound Beam, at the Paris Exhibition, 51
Engine, The Quillac Winding, at the Paris Exhibition, 178
Engine, Shanks and Sons' Horizontal, at the Royal Agricultural Show, Kilburn, 571
Engine, Simpson and Company's Horizontal Compound, 422
Engine, Sulzer, Trial of a, 161
Engine, Vosper's Four-Cylinder, at the Royal Agricultural Show, Kilburn, 574
Engine, Walschaert's Horizontal, at the Paris Exhibition, 29
Engine, Willan's Compound, at the Royal Agricultural Show, Kilburn, 574
Engineering, Civil, at the Paris Exhibition, 287, 316, 431
Engineers, The Amalgamated Society of, 462
ENGINEERS, THE AMERICAN INSTITUTE OF MINING:
On the Chemical Composition and Physical Properties of Steel Rails, by C. B. Dudley, 143, 166, 184
On the Butler Mine Fire Cut-off, by Henry Drinker, 206
On the Wearing Power of Steel Rails; does it Increase with the Hardness of the Steel? by Charles B. Dudley, 243
On the United States Testing Machine at Watertown Arsenal, by Alex. A. Holley, 267
ENGINEERS, THE INSTITUTION OF CIVIL:
Conversazione, 463
On the Best Methods of Railway Construction for the Development of New Countries, as Illustrated by the Railway Systems of South Australia, by R. C. Patterson, 103
On the Sandhurst Water Supply, Victoria, Australia, by Joseph Brady, 148
On the Construction of Heavy Ordnance, by J. A. Longridge, 157
ENGINEERS, THE INSTITUTION OF CIVIL—*continued*.
On the Geelong Water Supply, Victoria, Australia, by Edward Dobson, 167
On Movable Bridges, by James Price, 214
On the Electric Light Applied to Lighthouse Illumination, by J. N. Douglass, 262
On Dioptric Apparatus in Lighthouses for the Electric Light, by James T. Chance, 362
On Street Carriageway Pavements, by G. F. Deacon, 404
On Wood as a Paving Material under Heavy Traffic, by O. H. Howarth, 405
On the Improvement of the Bar of Dublin Harbour by Artificial Scour, by John P. Griffith, 442
On Dock Gates, by A. F. Blandy, 486
Engineers, the Institution of Cleveland, Address of the President, 18, 37
ENGINEERS, THE INSTITUTION OF MECHANICAL: 64, 284, 362, 378
On the Construction of Armour to Resist Shot and Shell, by Captain C. O. Browne, R.A., 69
On the Heslop Engine, a Chapter in the History of the Steam Engine, by H. A. Fletcher, 101
On the Economy of Railway Working, by B. Price Williams, 124, 145, 204, 224
On the Effect of Brakes upon Railway Trains, by Captain Douglas Galton, 371
On Recent Brake Experiments upon the Lyons Railway, by M. George Marié, 383
On Electric Lighting, by Dr. John Hopkinson, 403
On the Construction and Comparative Merits of the Safety Lamps generally in Use, by Alan C. Bagot, 423
On Experiments Referring to the Use of Iron and Steel in High-Pressure Boilers, by David Greig and Max Eyth, 527, 581
ENGINEERS, THE SOCIETY OF TELEGRAPH:
Conversazione, The, 524
On Experimental Researches into Means of Preventing Induction upon Lateral Wires, by Professor D. E. Hughes, 212
Engines, Agricultural, 557
Engines, Compound, Douglas and Grant's Three-Cylinder, of the Yacht "Isa," 195
Engines, Gas, 461
Engines, Hathorn and Davey's Pumping, at the Chiswick Main Drainage Works, 478
Engines, Miller and Company's Compound Reversing Rolling Mill, 274
Engines, Portable and Fixed, at the Royal Agricultural Show, Kilburn, 570
Engines, Pumping, for Water Works at Lawrence, Massachusetts, Trial of the, 56, 78
Engines, Steam Ploughing and Traction, at the Royal Agricultural Show, Kilburn, 575
Engines, Tank, The Distribution of Load upon the Axles of, 441
England and Scotland, Pollution of Rivers in, 138
English Industries and American Competition (*See Industries, English, and American Competition*)
Epinac Colliery Company (Saône-et-Loire), The; Coal Mining at the Paris Exhibition, 367
Equivalents, Mechanical; Watt Anniversary Lecture, 125
Escher, Wyss, and Company's Boiler with Ten-Brink Firegrate, at the Paris Exhibition, 437
Estimates, The Navy, 217
European and North American Railway; Canadian Railways, 228
European Russia, The Mineral Wealth of, 90, 169, 227, 450
Excavator, Reeves' Pneumatic, 312
EXHIBITION, THE PARIS:
Bevel Gear-Cutting Machine, Fetu and Delîge's, 195
Boiler, Carnaire and Montellier's Vertical Tubular, 284
Boiler with Ten-Brink Firegrate, Escher, Wyss, and Company's, 437
Civil Engineering:
Toulon Graving Docks, The, 287, 316, 376, 431
Coal Mining:
Blanzy Mines, The, 98
Epinac Colliery Company (Saône-et-Loire), The, 367
Grand' Combe Mines, The, 33
Crane, Caillard Brothers' Steam, 123
Derailed Rolling Stock, Apparatus for Replacing; Northern Railway of France, 459
Dye Products, Artificial, 162
Engine, Powell's Compound Beam, 51
Engine, The Quillac Winding, 178
Engine, Walschaerts' Horizontal, 29
Hydraulic Machine Tools, 65
Locomotives:
Belgium, 156, 171, 210, 271
France, 389, 454, 517
Italy, 22
Switzerland, 130
United States, 67
Metallurgy:
Works at Pont-à-Mousson, The, 208
Physical Science:
Lighthouse Illumination, 138, 209, 269
Meteorological Instruments, 6, 97
Theorell's Printing Meteorograph, 6
Ploughs, Single and Four-Furrow, Ransomes, Sims, and Head's, 437
Railway Rolling Stock:
Paris, Lyons, and Mediterranean Railway Company, The, 45, 110
Paris and Orleans Railway Company, The, 432
Southern Railway of France, The, 229
Western Railway of France, 341, 493
Testing Lubricants, Machinery for, 294
Therapeutic Machinery, Goransson's, 214
Tramway Locomotive, Merryweather's, 256
Explosion on Board H.M.S. "Thunderer," 31, 54, 138, 200, 220, 221, 244, 257, 261, 262
Explosion on Board H.M.S. "Thunderer," The Report of the Committee, 321, 344
Explosion, The Coltness Boiler, 479
Explosions, Boiler; Letter to the Members of the House of Commons, 278
Explosions, Boiler, in 1878; Report of Mr. E. B. Marten, 174
Explosions, Steam Boiler; Annual Meeting of the Manchester Steam Users' Association, 258
Explosions, Steam Boiler; Mr. Burt's Motion in the House of Commons, 397

Fetu and Deliège's Bevel Gear-Cutting Machine, at the Paris Exhibition, 195
Firebox Stays, Stephenson's Locomotive, 223
Firegrate, Ten-Brink, Escher, Wyss, and Company's Boiler with, at the Paris Exhibition, 437
Firegrates for Unbroken and Chopped Straw, Garrett and Sons', at the Royal Agricultural Show, Kilburn, 572
First-Class Carriage for the Western Railway of France, 341
Fixed and Portable Engines at the Royal Agricultural Show, Kilburn, 570
Floating Dock, The Nicolaieff, 29
Floating Docks, 381
Foreign and Colonial Notes, 14, 27, 61, 84, 105, 125, 141, 167, 200, 226, 247, 255, 278, 305, 326, 349, 406, 443, 472, 490, 511, 532, 555
Foster, F. Le Neve, 178
Four-Cylinder Engine, Vosper's, at the Royal Agricultural Show, Kilburn, 574
Four-Furrow and Single Ploughs, Ransomes, Sims, and Head's, at the Paris Exhibition, 437
Fowler and Company's Compound Semi-Portable Engine at the Royal Agricultural Show, Kilburn, 570
French Locomotives at the Paris Exhibition, 389, 454, 517
Friction Clutch, Pfleiderer's, 243
Frost, Glazed, 260
Froude, Mr. W., 463, 503, 525
Fucino, Lake, The Drainage of, 249
Fuel, The Utilisation of Sulphides as, 380
Fuller's Spiral Rule, 257
Furnace Linings, Basic Bricks for, 427
Furness's Band Saws for Cutting Deals, 235
Fuze, Percussion; The Hotchkiss Revolving Cannon, 25

Gap Lathe, Watson's, with Travelling Crane, 194
Garrett and Sons' Firegrates for Unbroken and Chopped Straw, at the Royal Agricultural Show, Kilburn, 572
Garrett and Sons' Portable Mining Engine at the Royal Agricultural Show, Kilburn, 572
Garrett and Sons' Thrashing Machine at the Royal Agricultural Show, Kilburn, 578
Gas Companies, The London, 327
Gas Engine, Clerk's, at the Royal Agricultural Show, Kilburn, 574
Gas Engine, Otto's 16-Horse Silent, at the Royal Agricultural Show, Kilburn, 574
Gas Engines, 461
Gas Illumination v. Electric, 117
Gas Managers, Meeting of the West of Scotland Association of, 511
Gas Managers, Meetings of the British Association of, 505, 520
Gas Supply, The Metropolitan, 260
Gas Washers and Scrubbers, 464
Gases Bill, The Noxious, 485
Gaslighting, Improved, 142
Gates, Dock, 486
Gauge, Stewart's Double-Check Pressure, 37
Gauge System, The; English Industries and American Competition, 86
Gear-Cutting Machine, Bevel, Fetu and Deliège's, at the Paris Exhibition, 195
Gear, Nelson's Steam Steering, 255
Gear, Trappen's Valve, 520
Geelong, The Water Supply of, 167
Geissler, Dr., 198
Generator, Steam, The Herreshoff, 121
Glass Fibres, Torsional Strain in, 19
Glazed Frost, 260
Goransson's Therapeutic Machinery at the Paris Exhibition, 214
Government Patent Bill, The, 180, 237, 417, 484
Gower Telephone, The, 387
"Graham" Lecture, The, 106
Grand' Combe Mines, The; Coal Mining at the Paris Exhibition, 33
Grand Trunk Railway of Canada; Canadian Railways, 270, 338, 388, 462
Graving Docks, The Toulon; Civil Engineering at the Paris Exhibition, 136, 287, 316, 376, 431
Greenwood and Batley's Milling Machine, 376
Grid, Hydraulic, Clark and Standfield's, 203
Grinding Lathes, Tyre, at the Austrian State Railway Works, 202
Grinding Maize, Ransomes, Sims, and Head's Mill for, 294
Grinding Processes, 187, 207
Gwynne's Centrifugal Pump at the Royal Agricultural Show, Kilburn, 573
Guano Company, The Native, 54
Guns, Naval, 301, 324

Hallside Steel Works, Miller and Company's Compound Reversing Rolling Mill Engines at, 274
Halpin's Horizontal Engine with Automatic Expansion Gear, 481
Handyside and Company's Bridge over the River Derwent at Derby, 292
Harbour, Dublin, The Improvement of, 442
Hartmann, Richard, 8

Hathorn and Davey's Pumping Engines at the Chiswick Main Drainage Works, 478
Health, Sewage, and Water Supply, The National, 439
Heavy Ordnance, 157
H.M.S. "Iris," Steam Trials of, 329
H.M.S. "Iris," Structural Arrangements and Proportions of, 302
H.M.S. "Thunderer," Explosion on Board, 31, 54, 138, 200, 220, 221, 244, 257, 261, 282
H.M.S. "Thunderer," The Explosion on Board; Report of the Committee, 221, 244
Herreshoff Boiler, The, 121
Herreshoff Torpedo Boat, The, 32, 94, 121
Hersent and Langlois' Dredging Plant at the Toulon Graving Docks, 136, 376, 431
Heslop Engine, The, a Chapter in the History of the Steam Engine, 101
High Blantyre Collieries, Stevenson's Mine Ventilator at the, 178
High-Level Bridge, Sedley's Proposed, over the Thames, 416
High-Pressure Marine Boiler, Boyer's, 416
History of the Screw Propeller, A Contribution to the, 13
Horizontal Compound Engine, Simpson and Company's, 422
Horizontal Engine, Compound, at the Pester Walzmühle, Buda-Pesth, 200
Horizontal Engine, Halpin's, with Automatic Expansion Gear, 481
Horizontal Engine, Shanks and Sons', at the Royal Agricultural Show, Kilburn, 571
Horizontal Engine, Walschaerts', at the Paris Exhibition, 29
Horograph, The, 241
Hotchkiss Revolving Cannon, The, 3, 23, 63
Hughes's, Professor, Induction Balance, 217
Hydraulic Grid, Clark and Standfield's, 203
Hydraulic Machine Tools at the Paris Exhibition, 65

Illumination, Gas *v.* Electric, 117
Illumination, Lighthouse, 262
Illumination, Lighthouse; Physical Science at the Paris Exhibition, 139, 209, 269
Illumination, The Rapieff System of, 55
Implements, Miscellaneous, at the Royal Agricultural Show, Kilburn, 534
Implements of Tillage at the Royal Agricultural Show, Kilburn, 534
Improved Gaslighting, 142
Improvement of Dublin Harbour, The, 442
Improvements in Telephones, Recent, 387
Incline, Railway, at Lyons, 291
Induction Balance, Professor Hughes's, 217
Induction Current Balance, An, 457
Induction, Electrical, 212
Induction, Electrical, Sonometry by, 418
Induction on Telegraph Lines, 280
Induction in Telephone Circuits; Mr. Edison's Specification, 277
India General Steam Navigation Company's Steamer "Tezpore," The, 276
INDUSTRIES, ENGLISH, AND AMERICAN COMPETITION:
Centralisation of Industry, 170
Futile Experiment, 209
Gauge System, The, 86
Invested Capital, 317
Machine Tools, American, 2
Wood as a Material in America, 47
Workshop Legislation, 208
Injuries to Servants, Employers' Liability for, 361
Inner Circle Completion Railway, The, 408
Inspection of Boilers, The, 533
Institute, The Iron and Steel (*See Iron and Steel Institute, The*)
Institution of Civil Engineers, The (*See Engineers, The Institution of Civil*)
Institution Conversazione, 1879, The, 463
Institution of Engineers, The Cleveland; Address of the President, 18, 37
Institution Lectures, The Royal, 11
Institution of Mechanical Engineers (*See Engineers, The Institution of Mechanical*)
Institution of Naval Architects, The (*See Naval Architects, The Institution of*)
Instruction, Mining, in Austria, 205
Instruments, Meteorological; Physical Science at the Paris Exhibition, 6, 97
International Telegraph Conference, The, 485
Invested Capital; English Industries and American Competition, 317
"Iris," H.M.S., Steam Trials of, 329
"Iris," H.M.S., Structural Arrangements and Proportions of, 302
Iron and Mild Steel, 393
Iron Mills, The Union, Pittsburgh, Pa.; American Iron and Steel Works, 21
Iron, Northern, Comparative Prices of, 313
Iron Prices and Ironworkers' Wages, 248
Iron Shipbuilders and Boiler-Makers, The, 501
Iron Shipbuilding at West Hartlepool, 132
Iron and Steel, The Application of the Spectroscope to the Analysis of, 127, 429
Iron and Steel Boilers, 527, 581
IRON AND STEEL INSTITUTE, THE: 398, 410, 444, 463
Address of the President, Mr. Edward Williams, 460
On the Use of Steel in the Construction of Bridges, by H. N. Maynard, 392
On the Mechanical Properties of Iron and Mild Steel (Supplementary Paper), by Daniel Adamson, 393
On the Use of Steel in Naval Construction, by Nathaniel Barnaby, 419
On the Elimination of Phosphorus in the Bessemer Converter, by Sidney G. Thomas, 424
On the Removal of Phosphorus and Sulphur during the Bessemer and Siemens-Martin Processes of Steel Manufacture, by George J. Snelus, 426
IRON AND STEEL INSTITUTE, THE—*continued.*
On a Ready Means of Moulding Lime, and making Lime or Basic Bricks, and Linings for Furnaces, Converters, &c., by Edward Riley, 427
On a New Volumetric Method of Determining Manganese in Manganiferous Iron Ores, Spiegeleisen, Steel, &c., by John Pattinson, 508
On the Chemistry of Puddling, by H. Louis, 509
IRON AND STEEL WORKS, AMERICAN:
Rolling Mills of the New Jersey Steel and Iron Company, 90
Salisbury Iron and the Works of the Barnum Richardson Company, 451
Union Iron Mills, Pittsburgh, Pa., The, 21
Works of Messrs. Cooper, Hewitt, and Company, The, 87, 149
Works of the Meier Iron Company, The, 315
Iron Trade in 1878, The Northern, 34
Iron Trade, The Scotch, Position and Prospects of, 123
"Isa," Yacht, Douglas and Grant's Three-Cylinder Compound Engines of the, 195
Italy; Locomotives at the Paris Exhibition, 22

Joints, Welded Boiler Plate, 96
Joly, Jolly, and Delafoy's Viaduct over the River Rance, at the Paris Exhibition, 481, 499

Kensington Museum, The Electric Light at, 502
Kitson's Loose Pulley Bearing, 243

Lake Fucino, The Drainage of, 249
Lambrigot's Sixpenny Phonograph, 326
Lamps, Safety, 433
Lartigue's Mercury Commutator, 273
Lathe, Watson's Gap, with Travelling Crane, 154
Lathe, Wheel Centre and Tyre Boring, Collier and Company's, 362
Lathes, Tyre-Grinding, at the Austrian State Railway Works, 392
Launch, The Herreshoff Torpedo, 32, 94, 121
Lecture, The "Graham," 106
Lectures, Royal Institution, 11
Legal Load Line, The, 332
Legislation, Boiler, 501
Legislation, Private Bill, 357
Legislation on our Rivers, 240
Legislation, Workshop; English Industries and American Competition, 208
Le Grand and Suicliff's Tubular Piles, 223
Letter to the Members of the House of Commons on Boiler Explosions, 278
Lever Anchor, Savage's Automatic, at the Royal Agricultural Show, Kilburn, 576
Liability of Employers to Workmen, 197
Liability for Injuries to Servants, Employers', 361
Light, The Albo-Carbon, 157
Light Apparatus, Edison's Electric, 159
Light Apparatus, Marshall, Sons, and Company's Portable Electric, 364
Light, The Electric, 341, 417
Light, The Electric, in the British Museum, 197
Light, The Electric, M. Cernuschi's Report, 104
Light, The Electric, at the Kensington Museum, 502
Light, The Electric, Mr. Preece on, 81
Light, The Electric, and Professor Tyndall, 75
Light, The Electric, Progress of, 181
Light, Electric, The Wallace-Farmer, 308
Light for Railways, Ransomes, Sims, and Head's Travelling Electric, 16
Light, The Westinghouse, for Railway Carriages, 364
Lighthouse Dioptric Apparatus, 362
Lighthouse Illumination, 262
Lighthouse Illumination; Physical Science at the Paris Exhibition, 139, 209, 269
Lighting, Electric, 403
Lighting, Electric, at the Albert Hall, 400
Lighting, Electric; Report of Committee of the House of Commons, 519
Lighting, Electric, at the Southampton Docks, 116
Lighting by Electricity, 513
Lighting System, Pintsch's, 311
Lines, Telegraph, Induction on, 280
Linings, Furnace, Basic Bricks for, 427
List of Materials, Price, 20, 42, 62, 84, 106, 126, 148, 168, 186, 206, 226, 248, 268, 286, 314, 336, 366, 386, 406, 428, 450, 472, 490, 512, 532
Lloyd's Surveyor's Report on Steel for Shipbuilding, 40
Lloyd's Yacht Register, 354
Load, The Distribution of, upon the Axles of Tank Engines, 441
Load Line, The Legal, 332
Locomotive, Bagnall's Tank, for the Wotton Tramway, 17
Locomotive Boilers, Verderber's, 113
Locomotive Firebox Stays, Stephenson's, 223
Locomotive, Merryweather's Tramway, at the Paris Exhibition, 256
Locomotives, American, at the Paris Exhibition, 67
Locomotives, Belgian, at the Paris Exhibition, 156, 171, 210, 271
Locomotives, French, at the Paris Exhibition, 339, 454, 517
Locomotives at the Paris Exhibition, 22, 67, 130, 136, 171, 210, 271, 389, 454, 517
Locomotives, Swiss, at the Paris Exhibition, 130
"London" Argand Governor Burner, Sugg's Lantern with, 142
London Gas Companies, The, 327
London Gas Supply, The, 260
London and St. Katherine Docks; Victoria Dock Extension, 456
Loose Pulley Bearing, Kitson's, 243
Loud-Speaking Telephone, Edison's, 442
Lubricants, Machinery for Testing, at the Paris Exhibition, 294
Lubricator, Englebert's, 479
Lyons, Railway Incline at, 291
Lysedal Viaduct, The, 1

Machine, An American Testing, 267
Machine, Asquith's Slotting, 257
Machine, Fetu and Deliège's Bevel Gear-Cutting, at the Paris Exhibition, 195
Machine Fitting, Standard Sizes for, 407
Machine, Ransomes, Sims, and Head's Thrashing, for Hot Climates, 323
Machine, Shaping, Sharp, Stewart, and Company's, 442
Machine Tools, American; English Industries and American Competition, 2
Machine Tools, Hydraulic, at the Paris Exhibition, 65
Machine, Tweedy's Boiler Drilling, 341
Machine-Worked Punkahs, 284
Machinery, Agricultural, Progress of, 533
Machinery, Goransson's Therapeutic, at the Paris Exhibition, 214
Machinery for Making Butter Kegs, Allen Ransome and Company's, at the Royal Agricultural Show, Kilburn, 569
Machinery, Steam Ploughing and Traction, at the Royal Agricultural Show, Kilburn, 575
Machinery for Testing Lubricants at the Paris Exhibition, 294
Machinery, Wood-Working, at the Royal Agricultural Show, Kilburn, 569
Machines, Reaping, at the Royal Agricultural Show, Kilburn, 538
Machines, Thrashing, at the Royal Agricultural Show, Kilburn, 535, 577
Magnetism, Terrestrial, A New Theory of, 221
Magneto-Electric Machines; Lighting by Electricity, 513
Manganese Bronze, 523
Manganese, The Determination of, 508
Manufacture, The Northern Plate, 14
Manufacture of Sanitary Paints, The, 328
Marine Boiler, Boyer's High-Pressure, 416
Marshall, Sons, and Company's Drum Guard for Thrashing Machine, at the Royal Agricultural Show, Kilburn, 573
Marshall, Sons, and Company's Portable Electric Light Apparatus, 364
Marshall, Sons, and Company's Under-Gear for 8-Horse Portable Engine, at the Royal Agricultural Show, Kilburn, 570
Marten's Report on Boiler Explosions in 1878, 174
Materials, Price List of, 20, 42, 62, 84, 106, 126, 148, 168, 186, 206, 226, 248, 268, 286, 314, 336, 366, 386, 406, 428, 450, 472, 490, 512, 532
Mauser Revolver, The, 51
Mechanical Equivalents; Watt Anniversary Lecture, 125
Mechanical Shipbuilding, On a System of, 341
Meeting, Annual, of the Manchester Steam Users' Association, 258
Meeting of the West of Scotland Association of Gas Managers, 511
Meetings of the British Association of Gas Managers, 505, 520
Meier Iron Company. The Works of the; American Iron and Steel Works, 315
Mercury Commutator, Lartigue's, 273
Merryweather's Tramway Locomotive at the Paris Exhibition, 256
Metallurgy at the Paris Exhibition, 208
Meteorological Instruments; Physical Science at the Paris Exhibition, 6, 97
Meteorology, Arctic, 475
Metropolitan Gas Companies, The, 327
Metropolitan Gas Supply, The, 260
Microphone Receivers, On Simple Forms of, 280
Mild Steel and Iron, 393
Mill for Grinding Maize, Ransomes, Sims, and Head's, 324
Miller and Company's Compound Reversing Rolling Mill Engines, 274
Milling Machine, Greenwood and Batley's, 376
Mills, Rolling, of the New Jersey Steel and Iron Company; American Iron and Steel Works, 90
Mine Fire Cut-off, The Butler, 206
Mine Ventilator, Stevenson's, at the High Blantyre Collieries, 178
Mineral Phosphates, 526
Mineral Products in Austria, 35
Mineral Waters, The Bourboule and Royat, 337
Mineral Wealth of European Russia, The, 90, 169, 227, 430
Mines, The Blanzy; Coal Mining at the Paris Exhibition, 98
Mines, The Grand' Combe; Coal Mining at the Paris Exhibition, 33
Mining, Coal, at Paris, 33, 98, 367
Mining Engine, Garrett and Sons' Portable, at the Royal Agricultural Show, Kilburn, 572
Mining Instruction in Austria, 205
Moments, Bending, 33
Movable Bridges, 214
Multiple Wood-Boring Machine, Richards and Atkinson's, 506
Museum, The British, The Electric Light in the, 197

Nalder and Nalder's Combined Thrashing Machine and Straw Elevator at the Royal Agricultural Show, Kilburn, 577
National Water Supply, Sewage, and Health, The, 439
Native Guano Company, The, 54
NAVAL ARCHITECTS, THE INSTITUTION OF: 279, 307, 357,
Address of the President, 293
Bye-Laws, New, 275
On Armour-Plating Ships of War, by Admiral Sir R. Spencer Robinson, 295
On Armour for Ships, by N. Barnaby, 360
On Naval Guns, by C. W. Merrifield, 301, 364
NAVAL ARCHITECTS, THE INSTITUTION OF—*continued.*
On the Structural Arrangements and Proportions of H.M.S. "Iris," by W. H. White, 302
On the True Nature of the Wave of Translation, and the Part it Plays in removing the Water out of the Way of a Ship with least Resistance, by J. Scott Russell, 304, 343
On Sir W. Thomson's Navigational Sounding Machine, by P. M. Swan, 320
On the Steam Trials of H.M.S. "Iris," by J. Wright, 329
On the Legal Load Line, by N. E. Porter, 332
On Twin-Ship Propulsion, by G. C. Mackrow, 334
On a System of Mechanical Shipbuilding, by J. Humphrys, 341
On Strains on Crankshafts, by J. T. Milton, 349
On a Few Years' Experience of the Screw Propeller, its Lessons and Results, by Arthur J. Maginnis, 351
On Lloyd's Yacht Register, by Dixon Kemp, 354
On the Double Power Floating Dock and the Hydraulic Grid, by Latimer Clark, 381
On the Minimum Area of Blade in a Screw Propeller necessary to form a Complete Column, by James H. Cotterill, 385
On an Instrument for Measuring the Angle through which a Ship Rolls or Pitches at Sea, by E. Clarke, 405
Naval Construction, The Use of Steel in, 419
Naval Guns, 301, 364
Navigations: Sounding Machine, Sir W. Thomson's, 320
Navy, The Chilian, 483
Navy Estimates, The, 217
Nelson's Steam Steering Gear, 255
New Brunswick and Canada Railway; Canadian Railways, 188
New Patent Bill, The, 180, 237, 417, 484
Newton, Wilson, and Company's Horograph, 241
Nicolaieff Floating Dock, The, 29
North American and European Railway; Canadian Railways, 228
Northern Iron, Comparative Prices of, 313
Northern Iron Trade in 1878, The, 34
Northern Plate Manufacture, The, 14
Northern Rail Manufacture, 57
Notes from Cleveland, 9, 30, 52, 77, 99, 121, 136, 165, 183, 196, 216, 236, 263, 283, 314, 324, 363, 376, 396, 416, 436, 460, 487, 498, 526, 579
Notes, Foreign and Colonial, 14, 27, 61, 84, 105, 125, 141, 167, 200, 226, 247, 255, 278, 305, 336, 363, 406, 443, 472, 490, 511, 532, 555
Notes from the North, 10, 35, 49, 77, 94, 121, 136, 165, 183, 196, 216, 236, 263, 278, 313, 324, 363, 376, 396, 421, 443, 460, 482, 500, 519, 579
Notes from Russia, 186, 247, 606
Notes from the South-West, 10, 30, 52, 77, 94, 141, 165, 183, 196, 216, 258, 283, 294, 324, 343, 396, 416, 443, 456, 482, 500, 526, 579
Notes from South Yorkshire, 10, 30, 49, 77, 99, 121, 141, 165, 183, 196, 216, 236, 258, 275, 314, 321, 343, 376, 402, 421, 438, 466, 482, 500, 519, 580
Noxious Gases Bill, The, 485
Noxious Vapours, 32

OBITUARY:
Collins, Mr. W. W., 241
Crawshay, Mr. R. T., 416
Cunliff, Mr. Richard S., 56
Foster, Mr. P. Le Neve, 178
Froude, Mr. W., 462, 503, 525
Geissler, Dr., 198
Hartmann, Mr. Richard, 8
Leslie, Mr., 165
Lewis, Mr. M. W., 555
Perry, Mr. J., 294
Reeves, Mr. S. J., 61
Sopwith, Mr. Thomas, 75
Woodcroft, Mr. Bennet, 140
Orange River, Bridge over the, at Bethalie, Cape of Good Hope, 371
Ordnance, Heavy, 157
Ores, Cleveland, Steel from, 377
Ores, Silver, Pan Amalgamation of, in Nevada and Colorado, 43, 128, 189, 369, 473, 491, 514
Oscillometer, The, 405
Otto's 16-Horse Silent Gas Engine at the Royal Agricultural Show, Kilburn, 574

Paints, Sanitary, The Manufacture of, 328
Pan Amalgamation of Silver Ores in Nevada and Colorado, 43, 128, 189, 369, 473, 491, 514
Panama Ship Canal, The Proposed, 518
Paris Congress, The, 118
Paris, Lyons, and Mediterranean Railway Company's Rolling Stock at the Paris Exhibition, The, 45, 110
Paris and Orleans Railway Company's Rolling Stock at the Paris Exhibition, 432
Parliamentary Bills, Scotch, 12
Patent Bill, The New, 180, 237, 417, 484
Pavements, Carriageway, 404
Pavements, Wood, 405
Percussion Fuze; The Hotchkiss Revolving Cannon, 25
Pfeiderer's Friction Clutch, 243
Phonograph, A Sixpenny, 326
Phosphates, Mineral, 526
Phosphorus, The Elimination of, 424
Phosphorus and Sulphur, The Removal of, 426
Photographic Reproduction, 200
Physical Science at the Paris Exhibition, 6, 97, 139, 209, 269
Piles, Le Grand and Suteliff's Tubular, 223
Pintsch's Lighting System, 311
Plate Manufacture, The Northern, 14
Ploughing and Traction Engines, Steam, at the Royal Agricultural Show, Kilburn, 575

Ploughs, Ransomes, Sims, and Head's Single and Four-Furrow, at the Paris Exhibition, 437
Pneumatic Excavator, Reeves', 312
Pollution of Rivers in England and Scotland, 138
Pont-à-Mousson, The Works at; Metallurgy at the Paris Exhibition, 208
Poole System of Grinding, The; Grinding Processes, 207
Portable Electric Light Apparatus, Marshall, Sons, and Company's, 364
Portable and Fixed Engines at the Royal Agricultural Show, Kilburn, 570
Portable 4-Horse Engine, 1853, Clayton and Shuttleworth's, 461
Porter-Allen Engine, The, 115
Position and Prospects of the Scotch Iron Trade, 123
Powell's Compound Beam Engine at the Paris Exhibition, 51
Power, Steam (The Progress of Agricultural Machinery), 543
President of the Cleveland Institution of Engineers, Address of the, 18, 37
President of the Institution of Naval Architects, Address of the, 293
President of the Iron and Steel Institute, Mr. Edward Williams, Address of the, 400
Price List of Materials, 20, 42, 62, 84, 106, 126, 148, 168, 186, 206, 226, 248, 268, 286, 314, 336, 366, 385, 406, 423, 450, 472, 490, 512, 532
Prices, Iron, and Ironworkers' Wages, 248
Prices of Northern Iron, Comparative, 313
Printing Meteorograph, Theorell's; Physical Science at the Paris Exhibition, 6
Private Bill Legislation, 357
Processes, Grinding, 187, 207
Professor Hughes's Induction Balance, 217
Professor Tyndall and the Electric Light, 75
Progress of Agricultural Machinery, 533
Progress of the Electric Light, The, 181
Progress, Our Scientific, 73
Projectile, A Winged, 235
Propeller, The Screw, 351, 385
Propulsion, Screw, 53, 259
Propulsion, Screw; Experiments by Mr. Griffiths, 198
Propulsion, Twin-Ship, 334
Provincial Sanitation, 11, 74, 159, 303
Puddling, The Chemistry of, 509
Pulley Bearing, Kitson's Loose, 243
Pump, Gwynne's Centrifugal, at the Royal Agricultural Show, Kilburn, 573
Pumping Engine, Auxiliary, with "Comet" Pumps, for the Yacht "Wanderer," Balfour and Company's, 574
Pumping Engine, Double-Acting, at the Bushtiehrad Coal Mines, 154
Pumping Engines, Hathorn and Davey's, at the Chiswick Main Drainage Works, 478
Pumping Engines for Water Works at Lawrence, Massachusetts, Trial of the, 58, 78
Punkahs, Machine-Worked, 284

Quillac Winding Engine, The, at the Paris Exhibition, 178

Rail Manufacture, Northern, 57
Rails, Steel, The Chemical Composition and Physical Properties of, 143, 166, 184
Rails, Steel, The Endurance of, 243
Railway Brake Trials, Continuous, 331
Railway Carriage Lighting; Pintsch's System, 311
Railway Carriages, The Westinghouse Light for, 264
Railway Construction, 103
Railway, The European and North American; Canadian Railways, 228
Railway, The Grand Trunk of Canada; Canadian Railways, 270, 338, 388, 452
Railway Incline at Lyons, 291
Railway, The Inner Circle Completion, 408
Railway, The New Brunswick and Canada; Canadian Railways, 188
Railway Rolling Stock at the Paris Exhibition, 45, 110, 229, 341, 432, 493
Railway Trains, The Effect of Brakes upon, 371
Railway, The Western Counties—Annapolis to Yarmouth; Canadian Railways, 108
Railway, The Windsor and Annapolis; Canadian Railways, 44
Railway Working, The Economy of, 124, 145, 204, 224
Raising Sunken Vessels, 102
Ransome's Machinery for Making Butter Kegs at the Royal Agricultural Show, Kilburn, 569
Ransomes, Sims, and Head's Mill for Grinding Maize, 324
Ransomes, Sims, and Head's Single and Four-Furrow Ploughs at the Paris Exhibition, 437
Ransomes, Sims, and Head's Thrashing Machines for Hot Climates, 323
Ransomes, Sims, and Head's Travelling Electric Light for Railways, 16
Rapieff System of Electric Illumination, The, 55
Reaping Machines at the Royal Agricultural Show, Kilburn, 538
Receivers, Microphone, On Simple Forms of, 289
Recent Improvements in Telephones, 387
Reeves' Pneumatic Excavator, 312
Regulating Electric Currents, 164
Removal of Phosphorus and Sulphur, The, 426
Replacing Derailed Rolling Stock, Apparatus for, at the Paris Exhibition, 459
Report of the Board of Trade on Continuous Brakes, 251
Report of the Committee on the Explosion on Board H.M.S. "Thunderer," 221, 244
Report of the Committee of the House of Commons on Electric Lighting, 519
Report of the Committee of the House of Lords on Tramways, 366
Report by Lloyd's Surveyor on Steel for Shipbuilding, 40
Report of Mr. E. B. Marten on Boiler Explosions in 1878, 174
Reproduction, Photographic, 200
Revolver, The Mauser, 51
Revolving Cannon, The Hotchkiss, 3, 23, 63
Richards and Atkinson's Multiple Wood-Boring Machine, 506
River Bars, The Removal of, by Induced Tidal Scour, 107, 474
River Clyde, Shipbuilding on the, in 1878, 26, 56
River Clyde, Steel Shipbuilding on the, 156
River Control, 60, 80
River Derwent, at Derby, Handyside and Company's Bridge over the, 292
River, Orange, Bridge over the, at Bethalie, Cape of Good Hope, 371
River Rance, Joly, Jolly, and Delafoy's Viaduct over the, at the Paris Exhibition, 481, 499
River Tees, Shipbuilding on the, 497
River Thames, Sedley's Proposed High-Level Bridge over the, 416
Rivers in England and Scotland, Pollution of, 138
Rivers, Legislation on our, 240
Road Roller, Aveling and Porter's Steam, at the Royal Agricultural Show, Kilburn, 575
Rolling Mill Engines, Miller and Company's Compound Reversing, 274
Rolling Mills of the New Jersey Steel and Iron Company; American Iron and Steel Works, 90
Rolling Stock, Apparatus for Replacing Derailed, at the Paris Exhibition, 459
Royal Agricultural Society, The, 551
Royal Institution Lectures, 11
Royat and Bourboule Mineral Waters, The, 337
ROYAL SOCIETY, THE; 398
On the Torsional Strain which Remains in a Glass Fibre after Release from Twisting Stress, by J. Hopkinson, D. Sc., F.R.S., 19
On Certain Means of Measuring and Regulating Electric Currents, by C. William Siemens, 164
On the Synthetic Examination of Vowel Sounds, by W. H. Preece and Augustus Stroh, 200
On an Induction Current Balance, and Experimental Researches made therewith, by Professor D. E. Hughes, 457
Soirée, 398, 440
Rule, Fuller's Spiral, 257
Russia, European, The Mineral Wealth of, 90, 169, 227, 430
Russia, Notes from, 186, 247, 506

Safety Lamps, 423
Safety Valve, Eave's Deadweight, 466
Salisbury Iron and the Works of the Barnum Richardson Company; American Iron and Steel Works, 451
Sandhurst, Victoria, The Water Supply of, 148
Sandringham Water Supply, The, 91
Sanitary Paints, The Manufacture of, 328
Sanitary Summary for 1878, 95
Sanitation, Provincial, 11, 74, 159, 308
Savage's Automatic Lever Anchor, at the Royal Agricultural Show, Kilburn, 576
Saws, Furness's Band, for Cutting Deals, 235
Science, Physical, at the Paris Exhibition, 6, 97, 139, 209, 269
Scientific Progress, Our, 73
Scotch Iron Trade, Position and Prospects of the, 123
Scotch Parliamentary Bills, 12
Scotland and England, Pollution of Rivers in, 138
Scours, Tidal, The Removal of River Bars by Induced, 107, 474
Screw Propeller, The, 351, 385
Screw Propeller, A Contribution to the History of the, 13
Screw Propulsion, 53, 259
Screw Propulsion; Experiments by Mr. Griffiths, 198
Screws, Twin, 137, 179
Scrubbers and Washers, Gas, 464
Sedley's Proposed High-Level Bridge over the Thames, 416
Servants, Employers' Liability for Injuries to, 361
Sewage Disposal at Stoke-upon-Trent, 262
Sewage, Health, and Water Supply, The National, 439
Shanks and Sons' Horizontal Engine at the Royal Agricultural Show, Kilburn, 571
Sharp, Stewart, and Company's Shaping Machine, 442
Ship Canal, Panama, The Proposed, 518
Shipbuilders, Iron, and Boiler-Makers, The, 501
Shipbuilding in 1878, Clyde, 26, 56
Shipbuilding, Iron, at West Hartlepool, 132
Shipbuilding, Mechanical, On a System of, 341
Shipbuilding on the River Tees, 497
Shipowners v. the Board of Trade, 325, 338, 439
Ships, Armour for, 300
Ships of War, Armour Plating, 295
Shot and Shell, The Construction of Armour to Resist, 69
Show, The Royal Agricultural, at Kilburn (*See Agricultural Show, The Royal, at Kilburn*)
Side Feed Thrashing Machine, Clayton and Shuttleworth's, at the Royal Agricultural Show, Kilburn, 578
Silver Ores, Pan Amalgamation of, in Nevada and Colorado, 48, 128, 189, 269, 473, 491, 514
Simple Forms of Microphone Receivers, On, 289
Simpson and Company's Horizontal Compound Engine, 422
Single and Four-Furrow Ploughs, Ransomes, Sims, and Head's, at the Paris Exhibition, 437
Sixpenny Phonograph, A, 326
Slotting Machine, Asquith's, 257
Society of Amalgamated Engineers, The, 462
Society, The Royal, (*See Royal Society, The*)
Society, The Royal Agricultural, 551
Society of Telegraph Engineers, Conversazione, 424
Society of Telegraph Engineers, The (*See Engineers, The Society of Telegraph*)
Soirée, The Royal Society, 398, 440
Sonometry by Electrical Induction, 418
Sopwith, Thomas, 75
Sounding Machine, Sir W. Thomson's Navigational, 320
Sounds, Vowel, The Examination of, 200
South African Telegraphs, 312
Southampton Docks, Electric Lighting at the, 116
South-West, Notes from the, 10, 30, 52, 77, 94, 141, 165, 183, 196, 216, 238, 285, 294, 324, 343, 396, 416, 443, 456, 482, 500, 526, 579
South Yorkshire, Notes from, 10, 30, 49, 77, 99, 121, 141, 165, 183, 196, 216, 236, 258, 275, 314, 321, 343, 376, 402, 421, 438, 466, 482, 500, 519, 580
Southern Railway of France Rolling Stock at the Paris Exhibition, 229
Speaking Telephones, 467, 488, 506
Spectroscope, The Application of, to the Analysis of Iron and Steel, 127, 429
Spiral Rule, Fuller's, 257
Springs, Thermal, Disappearance of the, at Teplitz, Bohemia, 198, 240
Spur Wheel, A Durable, 122
Standard Sizes for Machine Fitting, 407
Stannah's Stuffing-Box, 223
Steam Boiler Explosions; Annual Meeting of the Manchester Steam Users' Association, 258
Steam Boiler Explosions; Mr. Burt's Motion in the House of Commons, 397
Steam Crane, Caillard Brothers', at the Paris Exhibition, 123
Steam Cultivation (The Progress of Agricultural Machinery), 547
Steam Generator, The Herreshoff, 121
Steam Ploughing and Traction Engines at the Royal Agricultural Show, Kilburn, 573
Steam Power (The Progress of Agricultural Machinery), 543
Steam Road Roller, Aveling and Porter's, at the Royal Agricultural Show, Kilburn, 575
Steam Trials of H.M.S. "Iris," 329
Steamer, The Indus General Steam Navigation Company's, "Tezpore," 276
Steel Bridges, 392
Steel from Cleveland Ores, 377
Steel and Iron, The Application of the Spectroscope to the Analysis of, 127, 429
Steel and Iron Boilers, 527, 581
Steel Rails, The Chemical Composition and Physical Properties of, 143, 166, 184
Steel Rails, The Endurance of, 243
Steel Shipbuilding on the Clyde, 156
Steel for Shipbuilding, Report by Lloyd's Surveyor on, 40
Steel, the Use of, in Naval Construction, 419
Steering Gear, Nelson's Steam, 255
Stephenson's Locomotive Firebox Stays, 223
Stevenson's Mine Ventilator at the High Blantyre Collieries, 178
Stewart's Double-Check Pressure Gauge, 37
Stoke-upon-Trent, Sewage Disposal at, 262
Strain in Glass Fibres, Torsional, 19
Strains on Crankshafts, 349
Straw-Burning Portable Engine, Clayton and Shuttleworth's, at the Royal Agricultural Show, Kilburn, 570
Straw Elevator and Thrashing Machine, Nalder and Nalder's Combined, at the Royal Agricultural Show, Kilburn, 577
Structural Arrangements and Proportions of H.M.S. "Iris," 302
Stuffing-Box, Stannah's, 223
Sugg's Lantern with "London" Argand Governor Burner, 142
Sulphides as Fuel, The Utilisation of, 380
Sulphur and Phosphorus, The Removal of, 426
Sulzer Engine, Trial of a, 161
Summary, Sanitary, for 1878, 95
Sunken Vessels, Raising, 102
Supplementary Water Works at Vienna, The New, 287
Swedish Viaduct, The Lysedal, 1
Switzerland; Locomotives at the Paris Exhibition, 130

Tank Engines, The Distribution of Load upon the Axles of, 441
Tank Locomotive, Bagnall's, for the Wotton Tramway, 17
Tees, River, Shipbuilding on the, 497
Telegraph Conference, The International, 485
Telegraph, Cowper's Writing, 180
Telegraph Engineers, The Conversazione of the Society of, 524
Telegraph Lines, Induction on, 280
Telegraphs, South African, 312
Telephone, The Ader, 387
Telephone, Bell's, 498
Telephone Circuits, Induction in; Mr. Edison's Specification, 277
Telephone, Edison's Electro-Chemical, 238
Telephone, Edison's Loud-Speaking, 442
Telephone, The Gower, 387
Telephones, Articulating, 467, 488, 506
Telephones, Recent Improvements in, 387
Ten-Brink Firegrate, Escher, Wyss, and Company's Boiler with, at the Paris Exhibition, 437
Tendency of Travel, The, 313
Terrestrial Magnetism, A new Theory of, 221
Testing Machine, An American, 267
Testing Lubricants, Machinery for, at the Paris Exhibition, 234
"Tezpore," The Indus General Steam Navigation Company's Steamer, 276
Thames, River, Sedley's Proposed High-Level Bridge over the, 416
Theorell's Printing Meteorograph; Physical Science at the Paris Exhibition, 6
Therapeutic Machinery, Goransson's, at the Paris Exhibition, 214
Thermal Springs, Disappearance of the, at Teplitz, Bohemia, 198, 240
Thrashing Machine Drum Guard, Marshall, Sons, and Company's, at the Royal Agricultural Show, Kilburn, 578
Thrashing Machine, Garrett and Sons', at the Royal Agricultural Show, Kilburn, 578
Thrashing Machine for Hot Climates, Ransomes Sims, and Head's, 323
Thrashing Machine and Straw Elevator, Nalder and Nalder's Combined, at the Royal Agricultural Show, Kilburn, 577
Thrashing Machine with Side Feed, Clayton and Shuttleworth's at the Royal Agricultural Show, Kilburn, 578
Thrashing Machines at the Royal Agricultural Show, Kilburn, 535, 577
"Thunderer," H.M.S., The Explosion on Board, 31, 54, 138, 200, 220, 221, 244, 257, 261, 282
Tidal Scour, The Removal of River Bars by Induced, 107, 474
Tillage, Implements of (Progress of Agricultural Machinery), 534
Tools, American Machine; English Industries and American Competition, 2
Tools, Hydraulic Machine, at the Paris Exhibition, 65
Torpedo Boat, The Herreshoff, 32, 94, 121
Torpedo Warfare, Yarrow and Company's Boats for, 156
Torsional Strain in Glass Fibres, 19
Toulon Graving Docks, The; Civil Engineering at the Paris Exhibition, 136, 287, 316, 376, 431
Traction and Steam Ploughing Engines, at the Royal Agricultural Show, Kilburn, 575
Trade in Central Africa, Future, 310
Trade in 1878, The Northern Iron, 34
Trains, Railway, The Effect of Brakes upon, 371
Tramway Locomotive, Merryweather's, at the Paris Exhibition, 356
Tramway, Wotton, Bagnall's Tank Locomotive for the, 17
Tramways, Report of the Committee of the House of Lords on, 366
Translation, The Wave of, 304, 343
Trappen's Valve Gear, 520
Travel, The Tendency of, 313
Travelling Crane, Watson's Gap Lathe with, 154
Travelling Electric Light for Railways, Ransomes, Sims, and Head's, 16
Trial of the Pumping Engines for Water Works at Lawrence, Massachusetts, 58, 78
Trial of a Sulzer Engine, 161
Tubular Boiler, Carnaire and Montelier's Vertical, at the Paris Exhibition, 284
Tubular Piles, Le Grand and Sutcliff's, 223
Twin Screws, 137, 179
Twin-Ship Propulsion, 334
Tyndall, Professor, and the Electric Light, 75
Tyre Boring and Wheel Centre Lathe, Collier and Company's, 362
Tyre-Grinding Lathes at the Austrian State Railway Works, 392
Tweedy's Boiler Drilling Machine, 341

Under-Gear for 8-Horse Portable Engine, Marshall, Sons, and Company's, at the Royal Agricultural Show, Kilburn, 570
Union Iron Mills, Pittsburgh, Pa., The; American Iron and Steel Works, 21
United States; Locomotives at the Paris Exhibition, 67
Universal Milling Machine, Greenwood and Batley's, 376
Utilisation of Sulphides as Fuel, The, 380

Valve, Eave's Deadweight Safety, 466
Valve Gear, Trappen's, 520
Vapours, Noxious, 39
Ventilator, Stevenson's Mine, at the High Blantyre Collieries, 178
Verderber's Locomotive Boilers, 113
Vertical Tubular Boiler, Carnaire and Montelier's, at the Paris Exhibition, 284
Vessels, Raising Sunken, 102
Viaduct, The Lysedal, 1
Viaduct over the River Rance, Joly, Jolly, and Delafoy's, 481, 499
Victoria Dock Extension; London and St. Katherine Docks, 456
Vienna Water Works, The New Supplementary, 287
Voltaic Batteries; Lighting by Electricity, 513
Vosper's Four-Cylinder Engine at the Royal Agricultural Show, Kilburn, 574
Vote Recorder, Clerac's Electric, 112
Vowel Sounds, The Examination of, 200

Wages, Ironworkers', and Iron Prices, 248
Wallace-Farmer Electric Light, The, 308
Waischaerts' Horizontal Engine at the Paris Exhibition, 99
Warfare, Torpedo, Yarrow and Company's Boats for, 156
Washers and Scrubbers, Gas, 464
Water Supply of Geelong, The, 167
Water Supply of Sandhurst, Victoria, The, 148
Water Supply of Sandringham, The, 91
Water Supply, Sewage, and Health, The National, 439
Water Works at Lawrence, Massachusetts, Trial of the Pumping Engines for, 58, 78
Water Works of Vienna, The New Supplementary, 287
Waters, Mineral, The Bourboule and Royat, 337
Watson's Gap Lathe with Travelling Crane, 154
Watt Anniversary Lecture; Mechanical Equivalents, 125
Wave of Translation, The, 304, 343

Wealth, Mineral, of European Russia, The, 90 169, 227, 430
Welded Boiler Plate Joints, 96
West Hartlepool, Iron Shipbuilding at, 122
West of Scotland Association of Gas Managers, Meeting of the, 511
Western Counties Railway. Annapolis to Yarmouth; Canadian Railways, 108
Western Railway of France, First-Class Carriage for the, 341
Western Railway of France, The; Railway Rolling Stock at the Paris Exhibition, 341, 493
Westinghouse Brake, The, 85
Westinghouse Light, The, for Railway Carriages, 264
Wheel Centre and Tyre Boring Lathe, Collier and Company's, 262
Wheel, Spur, A Durable, 122
Wilian's Compound Engine, at the Royal Agricultural Show Kilburn, 574
Williams, Mr. Edward, President of the Iron and Steel Institute, Address of the, 400
Williamson's Report on Steel for Shipbuilding, 40
Winding Engine, The Quillac, at the Paris Exhibition, 178
Windsor and Annapolis Railway; Canadian Railways, 44
Winged Projectile, A, 235
Wood-Boring Machine, Richards and Atkinson's Multiple, 506
Wood as a Material in America; English Industries and American Competition, 47
Wood Pavements, 405
Wood-Working Machinery at the Royal Agricultural Show, Kilburn, 569
Woodcroft, Bennet, F.R.S., 140
Workmen, Liability of Employers to, 197
Works of the Barnum Richardson Company, The, and Salisbury Iron; American Iron and Steel Works, 451
Works of Messrs. Cooper, Hewitt, and Company, The; American Iron and Steel Works, 37, 149
Works of the Meier Iron Company, The American Iron and Steel Works, 315
Works at Pont-à-Mousson, The; Metallurgy at the Paris Exhibition, 208
Workshop Legislation; English Industries and American Competition, 208
Wotton Tramway, Bagnall's Tank Locomotive for the, 17
Writing Telegraph, Cowper's, 180
Yacht "Isa," Douglas and Grant's, Three-Cylinder Compound Engines of the, 195
Yacht Register, Lloyd's, 354
Yarmouth to Annapolis, Western Counties Railway; Canadian Railways, 108
Yarrow and Company's Boats for Torpedo Warfare, 156

LITERATURE.

CAMPAGNA de Roma. Studi dell Ingegnere, P. di Tucci Rome, 1878, 262
Coal Mines Inspection; its History and Results. By R. Nelson Boyd, F.R.G.S., F.G.S., 493
Electric Light, The: its Past History and Present Position. By T. C. Hepworth, 189
Hand-Book of Patent Law of all Countries. By William P. Thompson, C.E., 280
Instructions for Testing Telegraph Lines and the Technical Arrangements of Offices, written on behalf of the Government of India under the Orders of the Director-General of Telegraphs in India. By Louis Schwendler, Vol. I., 44
Journal de Mathématiques Elémentaires. By Henry Valbert, 262
Problem of Human Life, The, embracing the Evolution of Sound and Evolution Evolved. By Wilford, 328
Sound: A Series of Simple, Entertaining, and Inexpensive Experiments in the Phenomena of Sound, for the Use of Students of all Ages. By Alfred Marshall Mayer, 262
Useful Information on Practical Electric Lighting. By Killingworth Hedges, C.E., Memb. Inst. M.E., 149
Water and Water Supply. By Professor D. T. Ansted, M.A., F.R.S., &c., 14
Wrinkles and Receipts, compiled from the "Scientific American." A Collection of Practical Suggestions, Processes and Directions for the Mechanic, Engineer, Farmer, and Housekeeper. Edited by Park Benjamin, 189

Books Received, 35, 189, 262, 493

PARAGRAPHS.

ABATTOIR, Proposed Public, and Removal of Cattle Market at Hull, 438, 482
Abbotsbury Railway, Commencement of the, at Dorchester, 416
Accidents on St. Petersburg Tramways, 247
Adelaide and Mitcham Tramways, Progress of the, 286
Adelaide and Nairne Railway, Progress of the, 278
Adelaide, South Australia, The Lighting of, 363
Adelaide, South Australia, Tramways at, 216
Adrianople, A Tramway for, 532
African Sea, An Inland, 141
Agricultural Engineers' Association, Meeting of the, 415
Agricultural Implement Exhibition, The Glasgow, 396
Air, Carburetted: Erratum, 482
Air-Compressing Engines at Normanton, 99
Air Motors, Compressed, for Street Cars, 490
Albert Bridge, Adelaide, South Australia, Progress of the, 406
Alexandra Dock, Newport, The Electric Light at the, 100
Algerian Ironstone, 305
Algerian Minerals, 443
Allegheny Valley Railroad; The Permanent Way on the, 443
Amalgamation, Gas, 498
American Bridge Restoration, 532
American Bridges, 148, 336, 466, 532
American Cartridges for Turkey, 265
American Coal in Switzerland, 106
American Diamond Drills, 126
American Freight Car Repairs, 532
American Iron Trade, Progress of the, 112
American Locomotives, 16, 141, 226, 253, 264, 329, 473
American Locomotives in Switzerland, 141
American Mechanical Industry, 84, 247, 490
American Ordnance, 84
American Pig Iron, 285
American Railroad Extension, 105
American Railway Material, Shipments of, 83
American Rifles for Turkey, 497
American Shipbuilding Industry, 106
American Small Arms, Increased Manufacture of, 555
American Steam Line, New, 105
American Steam Shipbuilding, Progress of, 27
American Tramway Cars, 224
Americans, The, and New Zealand, 109
Americans, The, and Sheffield Rails, 438
Anniversary, The James Watt, 77
Antagonistic Action of the Colliers, The, 421
Applications for Parliamentary Powers, 99
Arbitration, The Curiosities of, 141
Arizona, Coal in, 14
Armour for Ships, Coal, 10
Artesian Tube Wells at Skegness, 438
Artesian Well in the Crimea, 247
Artesian Wells in South Australia, 255
Askern and its Drainage, 236
Auckland, New Zealand, Reclamations at, 321
Australian Mails, Contract for the, 14
Australian Railways, Progress of the, 222, 386, 436
Australian Telegraphy, 84, 153, 167, 205
Austro-Hungarian Railways, Progress of the, 141
Avonmouth Docks, The, 294, 324, 443, 456, 482, 579
Avonside Engine Company, Meeting of the, 294
Avonside Engine Works, Progress of the, 216, 294, 526
Axles, Locomotive, The Distribution of Loads on, 460
Ayrshire Agricultural Implement Exhibition, The, 376
Babydom of Machinery, The, 223
Baden Railways, The, 324
Baird's Steel Company, Russia, Progress of, 506
Baltic Works, Progress of the, 506
Belgian Coal Trade, The, 27, 255
Belgian and German Steel, 226
Belgian Mechanical Industry, 226
Belgian Metallurgy, 225
Belgian Minerals, 226
Belgian Steel Sleepers, 255
Belgium, Coal Production in, 57
Belgium, Iron in, 84
Belgium, Locomotives in, 305
Belgium, Steel in, 286
Belleville Boilers at the Paris Exhibition, The, 193
Berg and Mark Railway, Rails on the, 167
Bessemer, Sir Henry, 482
Bessemer Steel Making at Rhymney, 579
Bill, The Patent, 402
Bill, Proposed New Harbour, for Greenock, 482
Bill, The Rivers Conservancy, 363
Bills, Local, 121
Bills in Parliament, Scotch, 263, 278
Birkenshaw, The Improvements at, 77
Bishop Rock Lighthouse, The, 77
Blaenavon Iron and Steel Company, Proposed Reduction of Wages by the, 53, 94
Blast Furnaces in the Cleveland District, 498, 579
Blast Furnaces at Langloan Iron Works, 313
Blast Furnaces at Sirhowy, Blowing out of the, 10
Blochairn Iron Works, The, 443
Blowing out more Blast Furnaces at Cleveland, 579
Blue Star Line of Steamers, The, 27
Board, An Independent, for Rotherham, 10
Board The Metropolitan, and the Thames, 36
Boiler Insurance Company; Mr. J. F. L. Crossland, Engineer of the, 314
Boiler, Insurance Company; Mr. Neil McDougal, Manager of the, 283
Boilers, American Locomotive, 255
Boilers, The Belleville, at the Paris Exhibition, 193
Bolckow, Vaughan, and Company's South Bank Blast Furnaces, 396
Bombay, Baroda, and Central India Railway, Fuel on the, 61, 120
Bombay, Baroda, and Central India Railway, Locomotives on the, 14, 61
Borsig Works, Germany, The, 168
Boston and Maine Railroad, Steel Rails on the, 61
Brake Trials, The Vacuum, 363
Brakes, Railway, Damages for the Failure of, 497
Bremen, Tramways at, 393
Bridge, The Albert, Adelaide, South Australia, Progress of, 406
Bridge, The East River, 27, 512
Bridge, The Forth, Progress of, 314, 460, 500
Bridge, The Murray, Completion of, 512
Bridge, New, over the River Taff, 396
Bridge, Railway, The New Caledonian over the Clyde, 324, 500
Bridge Restoration, American, 532
Bridge over the River Volga, Railway, 247
Bridges, American, 148, 336, 466, 532
Bridges, Improved, 343
Bridges, Iron, on the Bombay, Baroda, and Central India Railway, 84
Bridges, Iron, on the Boston and Albany Railroad, 200
Bridges for the St. Louis, Kansas City, and Northern Railway, 511
Bridlington, New Projects at, 343
Brisbane River, Queensland, Proposed Improvement of the, 225
Bristol, Gas at, 283
Bristol Tramways Extension, 196, 294
Bristol, Water at, 258, 283
British Steam Shipping, Annual Statement of the, 507
Brooklyn Bridge, The Strength of the, 406
Brown, Bayley, Dixon, and Company's Report, 223
Brown, John, and Company, Report of, 580
Bucharest Tramways, Progress of, 193
Cail, J. F., and Company, 61
Caledonian Bridge over the Clyde, The, 324, 500
Caledonian Railway Company, Half-yearly Report of the, 216
Caledonian Railway Statistics, The, 314
Callander and Oban Railway Extension, 324
Canadian Pacific Railway, Progress of the, 265, 278
Canadian Railway Contracts, 255
Canadian Railways, Progress of the, 100, 214
Canal, The Nicaragua, 450
Canal, The Suez, 61, 84, 167, 226, 425
Cannon, The Hotchkiss Revolving, 487
Cantor Lectures at the Society of Arts, The, 126
Capital and Labour, 30
Car Signal, An Electric, 105
Car Wheels, Utilising Old, 578
Carburetted Air: Erratum, 482
Cardiff, Trade at, 10, 141, 165, 241, 258, 456, 482, 526
Cardiff Water Supply, The, 381
Carron Iron Company Pits, Stoppage of Work at the, 165
Cars, American Railroad, 362
Cars, Pullman, 226
Cartridges for Turkey, American, 265
Cattle Market at Hull, Removal of, and Proposed Public Abattoir, 482
Channel, Sounding the, 354
Chapman, Mr. Henry, Presentation of a Piece of Plate to, 10
Cherbourg Route to France, The, 283
Chesterfield and Derbyshire Institute of Engineers, Meetings of the, 77, 376
Chesterfield, Tramways at, 321
Chicago, Milwaukee, and St. Paul Railroad, Locomotives on the, 532
Church Fenton Railway, The Proposed, 258
Clay Lane and South Bank Iron Works, The, 165, 283
Clevedon, Introduction of the Narrow Gauge at, 416
Cleveland District, Failures in the, 436, 487
Cleveland Engineering and Shipbuilding, Progress of, 9, 52, 77, 136, 165, 183, 196, 216, 283, 324, 396, 460, 487, 526
Cleveland Finished Iron Trade, The, 9, 30, 52, 77, 99, 136, 165, 196, 216, 236, 263, 283, 324, 363, 376, 416, 436, 460, 487, 526, 579
Cleveland Iron Market, The, 9, 30, 52, 77, 99, 121, 136, 165, 183, 196, 216, 236, 263, 283, 314, 324, 363, 376, 396, 416, 436, 460, 487, 498, 526, 579
Cleveland Iron Trade, Quarterly Meetings of the, and the Steel Question, 30, 314
Cleveland Ironmasters' Association Returns, The, 30, 77, 314, 396
Cleveland Ironworkers and their Wages, 52, 324
Cleveland, The Outlook in, 460
Cleveland, The Steel Question in, 52, 324
Cleveland Steel Trade, The, 216, 236, 263, 324, 436, 579
Clifton Extension Railway, Progress of the 500
Clocks, Locomotive, on the Northern of France Railway, 443
Clocks, Public, in Glasgow, Regulation of, 126
Closing the Wauntreodd Works, near Cardiff, 216

Clyde Shipbuilding Trade, Progress of the, 196, 396
Coal, American, in Switzerland, 166
Coal in Arizona, 14
Coal Armour for Ships, 10
Coal on the Bombay, Baroda, and Central India Railway, 61, 120
Coal and Coke Trades, The Cleveland, 52, 77, 121, 183, 196, 216, 263, 283, 324, 436, 487, 526
Coal, Discovery of, at Pontypridd, 482
Coal Dust Burning Locomotives, 14
Coal Dust and Explosions, 402
Coal in France, 264
Coal in the Garw Valley, 30
Coal, Gas, for Paris, 122
Coal, Indian, 125
Coal in Iowa, 205
Coal, Japanese, 323
Coal, New Zealand, 16
Coal, Nova Scotian, 406
Coal Pits, The Proposed Stoppage of Work at, 519
Coal Production in Belgium, 57
Coal in Prussia, 51
Coal at San Francisco, 255
Coal, Shipment of a Large Quantity of, from Penarth Dock, 416
Coal Shipments, South Wales, 77
Coal-Shipping Machinery, 383
Coal in Spain, 27, 84
Coal and Stone in Queensland, 255
Coal Trade, The Belgian, 27, 255
Coal Trade, The French, 14, 84, 141
Coal Trade, The Glasgow, 165, 363
Coal Trade, The South Welsh, 10
Coal Trade, The Strike in the, and its Effect on Cleveland, 314
Coal in Victoria, 532
Coal, Westphalian, 200
Coast Surveys, Australian, 167
Coatbridge Iron Works, Trades Unionism in a, 136
Cochin and Travancore Railway, Progress of the, 321
Coke in Colorado, 295
Coke and Gaslight Company, The, 362
Collieries, The Lightmoor, 30
Collieries, The Pensher, Proposed Re-opening of, 283
Colliers, The Antagonistic Action of the, 421
Colliers, The Monmouthshire, 294
Colliers in the Neath Valley, The, 443
Colliers' Wages in Dean Forest, 196
Colliers' Wages at Dowlais, 396, 456
Colliers' Wages in South Wales, 482
Colliery Owners and Miners in South Yorkshire, Dispute between the, 402, 421, 438, 466
Colliery Property in South Yorkshire, Depreciation of, 376
Colliery, South Medomsley, The Sale of, 498
Cologne Tramways, 275
Company, The Fives-Lille, Progress of, 27
Company, A New Telephone, in Sheffield, 343
Compressed Steel at the Obouchoff Steel Works, Russia, 186, 506
Coney Island Pier, The, 532
Contract for the Oban Railway, 324
Contract for Steel Rails, A, 141
Contracts, New Shipbuilding, on the Clyde, 216
Contracts for Turntables in Belgium, 141
Coquillion's Fire Damp Indicator, 103
Costa Rica Railways, Progress of the, 555
Cotton Mills in Poland, 186
Cotton for the Russian Army, 506
Cotton Warehouse, A Monster, in New Orleans, 61
Conversazione of the Institution of Civil Engineers, The, 376, 415
Crace Collection, The, at the South Kensington Museum, 147
Crawshay, Mr. R. T., Death of, 416
Crossland, Mr. J. F. L., Engineer of the Boiler Insurance Company, 314
Crossties, Iron, on the Philadelphia and Reading Railroad, 532
Curiosities of Arbitration, The, 141
Currie, Mr. Donald, and the Associated Shipwrights of Scotland, 77
Cyclops Works, Lord Cranbrook at the, 500

Darlington Iron Company, Annual Meeting of the, 263
Dearne Valley, New Water Company in the, 30
Death of Mr. R. T. Crawshay, 416
Death of Mr. Leslie, a well-known Railway Contractor, 165
Death of Mr. M. W. Lewis, 555
Death of Mr. J. Perry, 294
Death of Mr. S. J. Reeves, a Great Bridge Builder, 61
Decimal Metric System, The, 443
Defences at Bridlington, New Sea, 49
Dephosphorising Pig Iron, Krupp's Process for, 266
Depreciation of Colliery Property in South Yorkshire, 376
Dercos Lines for the Defence of Constantinople, The, 532
Despatch at Swansea, Quick, 482
Destruction of Timber Lands, The, 167
Detroit, River, Tunnelling The, 486
Devonport Dockyard, Ships in Progress at, 216
Diamond Drill, An American, for Victoria, 14
Diamond Drills, American, 196
Dinner, Annual, of the Students of the Institution of Civil Engineers, 466
Disaster, The Szegedin, 362
Discovery of Coal at Pontypridd, 482
Discovery of Graphite in New Zealand, 142
Discovery of a New Mineral, 61
Disposal of Salisbury Sewage, The, 416
Dispute between the Colliery Owners and Miners in South Yorkshire, 402, 421, 438, 466
Disputes, Trade, at Cleveland, 30
Distribution of Loads on Locomotive Axles, The, 460
Dock, A Disputed, at Melbourne, 16
Dock Gate, The Portishead, 324
Dock, New Floating, for Neath, 579
Dock, New Graving, for Leith, 236
Dock, New, at Swansea, 482
Dock, The Old Yarra, 126
Dock, The Portishead, 324, 396
Dock, Proposed New, at Inverkeithing, 500
Dock, The Queen's, Hull, Improvements of, 141
Dock Works, The Leith, 421
Docks, The Avonmouth, 294, 324, 443, 456, 482, 579
Docks, the Grangemouth, Progress of, 579
Docks, The Milford, 30
Docks, New Graving, on the River Tyne, 61
Docks, The Proposed Avon, 482
Dockhouse for Steamships, Improved, at New York, 247
Dockyard, The Keyham, Progress of Works at, 141
Dockyard, The Pembroke, 10
Dockyard, The Portsmouth, Reductions at, 141
Doncaster, The Improvements at, 77
Doncaster and its Water Supply, 10, 402
Donetz Railway, Russia, Opening of the, 186
Dorchester, Commencement of the Abbotsbury Railway at, 416
Doubling the London and South-Western Railway, 52
Dowlais Colliery, Strike at the, 456
Drainage of Askern, The, 236
Dredger, Steam, for Melbourne, Launch of a, 99
Dried Bread, Curious Use of, 247
Duffield Sewerage, The, 77
Drifts, Snow, on Russian Railways, 247
Dronfield Water Scheme, The, 196, 314
Dunbar Harbour, The, 324
Dundee Water Works, The, 94
Dunkerque, Proposed Improvement of the Port of, 236
Durable Spur Wheel, A, 147
Durham Miners' Strike, The, and the Cleveland Iron Trade, 324, 416

East Indian Railway, Permanent Way on the, 106
East, Railway Progress in the, 532
East River Bridge, The, 27, 512
East River Bridge, Steel for the, 512
Eastern of France Railway, Rolling Stock on the, 490
Eastern of Massachusetts Railroad, Locomotives on the, 27, 61
Eastern of Massachusetts Railroad, Permanent Way on the, 27
Ebbw Vale Steel, Coal, and Iron Company's Mines, Closing of the, 416
Ebbw Vale Steel Works, Progress of the, 283
Eddystone Lighthouse, The, 165, 443, 526
Edinburgh Association of Science and Art, Meetings of the, 363, 396
Edinburgh and Leith Engineers' Society, Meetings of the, 77, 216, 313, 421, 460
Edinburgh New Water Works, The, 519
Electric Car Signal, An, 105
Electric Lanterns for the Russian Government, 141
Electric Light, The, at the Alexandra Dock, Newport, 100
Electric Light, Application of the to Railway Stations, 165
Electric Light, The, at Avonmouth Dock, 141
Electric Light, The, in a Factory, 36
Electric Light in France, The, 415
Electric Light, The, in the Nevsky Locomotive Works, Russia, 186
Electric Light in New Zealand, The, 167
Electric Light at the Severn Bridge, The, 165, 196
Employers' Liability to Workmen, 396
Engine Works, The Avonside, Progress of, 216, 294, 526
Engineering, Sanitary, An Opening for, 141
Engineering and Shipbuilding, The Cleveland, Progress of, 9, 52, 77, 136, 165, 183, 196, 216, 283, 324, 396, 460, 487, 526
Engineering and Shipbuilding Trades, Scotland, Wages in the, 10, 35, 94, 121, 196, 216, 236, 263, 376, 421, 482
Engineering Society, King's College, Meetings of the, 147, 153, 193, 255
Engineering Society, Liverpool, Meetings of the, 52
Engineering Trades, South Yorkshire, Progress of the, 466, 580
Engineers' Association, Agricultural, Meeting of the, 415
Engineers, Gas, A Question for, 10
Engineers, Meetings of the Cleveland Institution of, 99, 121, 136, 363
Engineers, Naval, 30
Engines, Steam Fire, for London, 343
English Rails on the Continent, 255
Errata, 178, 232, 416, 482
Escaping Steam, Obviating the Noise of, 555
Exhibition, The Ayrshire Agricultural Implement, 376
Exhibition, The Glasgow Agricultural Implement, 396
Exhibition, The International Agricultural, 234
Exhibition, The Late Paris, 278
Exhibition, A Mexican, 30, 205, 438
Exhibition of 1883, The New York, 577
Exhibition, The Sydney International, 526
Expensive Scheme at Hull, An, 165, 275
Experiments, Important, in Steel Manufacture at Sheffield, 519
Explosions and Coal Dust, 402

Failure of the Rosedale and Ferryhill Company, 77, 99
Failure of a Scotch Shipbuilding Firm, 396
Failures in the Cleveland District, 436, 487
Fairfield Association, Glasgow, Meetings of the, 77, 165, 236, 324, 376
Fast Trains from Paris to Marseilles, 406
Ferry-Boat Dock Scheme at Hull, The, 165, 275
Ferry Steamer, A Monster American, 278
Fifty-Four Hours' Movement in Scotland, The, 35, 77, 196, 216, 236, 263, 376, 421, 482
Filey, The New Harbour at, 49, 196
Filey, The Sea at, 258
Finished Iron Trade, The Cleveland, 9, 30, 52, 77, 99, 136, 165, 196, 216, 236, 263, 283, 324, 363, 376, 416, 436, 460, 487, 526, 579
Fire Brigade, The London, 396
Fire Damp Indicator, M. Coquillion's, 103
Fire Engines, Merryweather's Steam, for Szegedin, 278
Fires, Serious, in Scotland, 94
Fives-Lille Company, Progress of the, 27
Floating Dock, New, for Neath, 579
Forest of Dean, Trade in the, 10, 196, 343, 500
Forth Bridge, Progress of the, 314, 460, 500
Fortifying a Treasury in the United States, 168
Foundry Pig in North-Eastern France, 443
France, Coal in, 264
France, Locomotives in, 324
France, The Production of Iron in, 258
France, Steel in, 286
Fraserburgh Harbour Works, The, 196
Freight Car Repairs, American, 532
Freight Cars, Iron, 216
French Coal Trade, The, 14, 84, 141
French and German Railways, 125
French Iron Trade, Progress of the, 153, 443
French Mechanical Industry, 226
French Narrow Gauge Lines, 196
French Railway Travelling, 580
French Railways, Progress of the, 125, 157, 532
French Steam Line, New, 512
French Steam Navigation, 490
French Torpedo Vessel, New, 511
Frith University, Sheffield, The, 466
Frome Water Works, The, 416
Fuel on the Bombay, Baroda, and Central India Railway, 61, 120
Furnace, A New Russian, 186
Furnaces, Blast, in the Cleveland District, 498
Furnaces, Blast, at Langloan Iron Works, 213
Furnaces, Blowing out more Blast, at Cleveland, 579
Furnaces, Bolckow, Vaughan, and Company's South Bank Blast, 396

Gallician Petroleum, 255
Garw Valley, Coal in the, 30
Gas Amalgamation, 498
Gas at Bristol, 283
Gas Coal for Paris, 122
Gas Engineers, A Question for, 10
Gas Lamps, Large, at Westminster Bridge, 248
Gas in Paris, 295
Gaslight and Coke Company, The, 362
General Rosser appointed Engineer of the Northern Pacific Railroad, 103
German and Belgian Steel, 226
German and French Railways, 125
German Navy, Progress of the, 363
German Underground Telegraphs, 475
Gigantic Saw for the Sydney Exhibition, 402
Glasgow Agricultural Implement Exhibition, The, 396
Glasgow Coal Trade, Progress of the, 165, 363
Glasgow Finished Iron Trade, Progress of the, 519
Glasgow Pig-Iron Market, The, 10, 35, 49, 77, 94, 121, 136, 165, 183, 196, 216, 236, 263, 278, 313, 324, 363, 376, 396, 421, 443, 460, 482, 500, 519, 579
Glasgow Sewage, The Disposal of, 376
Glasgow and South-Western Railway Company, Half-yearly Report of the, 216
Gloucester Canal, Landslip on the, 30
Gloucester Tramways, Progress of the, 116, 456
Gold Medal for the Belleville Boilers at the Paris Exhibition, 193
Gold Mining in Victoria, 196, 512
Gold in Russia, 532
Goole, The Lighting of, 99
Goole Water Supply, The, 216
Government Offices, New, at Cardiff, 416
Grangemouth Docks, Progress of the, 579
Graphite in New Zealand, Discovery of, 142
Graving Dock, New, for Leith, 236
Graving Docks, New, on the River Tyne, 61
Graving Slip in Portree Harbour, 313
Great Bridge Builder, Death of a, 61
Great Northern Telegraph Company, The, 84, 157, 226
Great Western Railway Improvements, 30
Great Western Railway, Speed on the, 456
Great Western Railway Working Expenses, 196
Greenock Sugar Refineries, The, 94
Guion Liner, The New, 460
Gun, Krupp's Great Steel, 363

Harbour Accommodation, South Australian, 27
Harbour Bill, Proposed New, for Greenock, 482
Harbour Bill, The Wick, 443
Harbour Board, The Peterhead, Meeting of the, 77
Harbour, The Dunbar, 324
Harbour Improvements, Proposed at Largs Bay, Australia, 125
Harbour, The New, at Filey, 49, 196
Harbour, New York, Submarine Work in, 472
Harbour, The Victor, South Australia, Progress of, 168
Harbour, The Wick, 165, 443
Harbour Works, The Fraserburgh, 136
Harbour Works, The Scarborough, 500
Harris's New Navigation Pits, 324, 416, 500
Heating and Ventilating Railroad Cars, 490
Heavy Trades in South Yorkshire, The, 500
H.M.S. "Mercury," Trial Trip of, 283
Herreshoff Torpedo Boats, The, 506
High Tides in the Severn, 324
Highland Railway, Half-yearly Report of the 324
Honduras, Telegraphy at, 532
Hornsea Pier, Progress of the, 216
Hotchkiss Revolving Cannon, The, 487
Hull Ferryboat Dock Question, The, 165, 275
Hull, The Lighting of, 258
Hull and its Market Accommodation, 423, 482
Hull, Proposed New Line of Railway into, 466 482, 519

Ilkeston, The New Midland Railway Station 402
Improved Bridges, 343
Improvements at Birkenshaw, The, 77
Improvements at Doncaster, The, 77
Improvements in Rotherham, 99
Improvements, Sanitary, in Leeds, 236
Improvements in Sheffield, 10, 30, 141, 216, 482
Improvements in Welbeck, 99
"Increasing Trade," An Extraordinary, 275
Indian Cities, The Population of, 532
Indian Coal, 125
Inland Sea, An African, 141
Institute, The Sanitary, of Great Britain, 506
Institution of Civil Engineers, The French Election of President, 94
Institution of Civil Engineers, Meetings of the, 57, 168, 202, 255, 275, 376, 402, 415, 466
Institution of Engineers and Shipbuilders, Scotland, Meetings of the, 263, 376, 443
International Agricultural Exhibition, The, 234
Inverkeithing, Proposed New Dock at, 500
Iowa, Coal in, 205
Iron in Belgium, 84
Iron Bridges on the Bombay, Baroda, and Central India Railway, 84
Iron Bridges on the Boston and Albany Railroad, 200
Iron Company, The Carron, Stoppage of Work at the Pits of, 165
Iron Crossties on the Philadelphia and Reading Railroad, 532
Iron in France, The Production of, 258
Iron Freight Cars, 216
Iron Lighthouse, An American, 499
Iron Manufacture in India, 27
Iron Market, The Cleveland, 9, 30, 52, 77, 99, 121, 136, 165, 183, 196, 216, 236, 263, 283, 314, 324, 363, 376, 396, 416, 436, 460, 487, 526, 579
Iron in New Zealand, 241
Iron Ore, Spanish, 363
Iron Ores, Portuguese, 336
Iron Permanent Way in Belgium, 147
Iron, Pig, in Pennsylvania, 141
Iron, Pig, in the United States, The Cost of, 84
Iron Sleepers in Belgium, 294
Iron and Steel Institute, Meeting of the, 363
Iron and Steel Rails in the United States, 84
Iron Trade, The American, Progress of, 112
Iron Trade at Cleveland, The, and the North-Eastern Railway Rates, 288
Iron Trade, The French, Progress of, 153, 443
Iron Trade, The Glasgow Finished, Progress of, 519
Iron Trade, The Pennsylvania, 27
Iron Tubing for Refrigerator Cars, 555
Iron Works, The Blochairn, 443
Iron Works, The Clay Lane and South Bank, 165, 283
Iron Works, New Russian, 186
Ironmaking Firm at Middlesbrough, Suspension of an, 416
Ironmasters' Association Returns, The Cleveland, 30, 77, 314, 39
Ironstone, Algerian, 305
Ironworkers, Cleveland, and their Wages, 52, 324
Ironworkers' Wages, Scotland, Reduction of, 482
Italian Railways, Progress of the, 416

Japan Coal, 323
Japan, Labour in, 428
Japan Railways, 156
Jetties, The Mississippi, 77

Keighley Sewage, The, 121
Keyham Dockyard, The Works at, 141
Kolpino Works, Progress of the, 506
Krupp of Essen, 580
Krupp's Great Steel Gun, 363
Krupp's Mild Steel, 371
Krupp and Pig Iron, 116
Krupp's Process for Dephosphorising Pig Iron, 266

Labour and Capital, 30
Labour in Japan, 428
Lake, Proposed, in Pontefract Park, 30
Lamps, Large Gas, at Westminster Bridge, 248
Landore Steel Works, The, 52
Landslip on the Gloucester Canal, 30
Lanterns, Electric, for the Russian Government, 141
Largs Bay, Australia, Proposed Improvements at, 125
Launch of the "Orient" Steamer, 500
Launch of a Steam Dredger for Melbourne, 99
Laying of Pits Idle, The Proposed, 519
Leeds New Station Extensions, 49
Lehigh Valley Railroad, Progress of the, 247
Leith Dock Works, The, 421
Leslie, Mr., Railway Contractor, Death of, 165
Lewis, Mr. M. W., Death of, 555
Liability to Workmen, Employers', 396
Life of Railway Material, The, 498
Light Draught Steamers, Yarrow's, for Columbia, 283
Light, The Electric, Application of, to Railway Stations, 165
Light, The Electric, at Avonmouth Dock, 141
Light, Electric, in a Factory, 36
Light, The Electric, in France, 415
Light, The Electric, in the Nevsky Locomotive Works, Russia, 186

Light, The Electric, in New Zealand, 167
Light, The Electric, at the Severn Bridge, 165, 196
Light Railway, The Swindon and Highworth, Progress of, 196
Lighthouse, The Bishop Rock, 77
Lighthouse, The Eddystone, 165, 443, 526
Lighthouse, Iron, An American, 499
Lighthouses, New Zealand, 490
Lighting Adelaide, South Australia, 363
Lighting of Goole, The, 99
Lighting of Hull, The, 255
Lightmoor Collieries, The, 30
Liner, the New Guion, 460
Lines, The Dereos, for the Defence of Constantinople, 532
Liverpool Engineering Society, Meeting of the, 52
Loads on Locomotive Axles, The Distribution of, 460
Loan for Public Improvements in Sheffield, A, 10
Loan for Western Australia, A, 19
Local Bills, 121
Locomotive Boilers, American, 255
Locomotive Building, American, 329, 472
Locomotive Clocks on the Northern of France Railway, 443
Locomotive Economy on the Eastern Railroad of Massachusetts, 61
Locomotive, A New Tramway, 84
Locomotive Works, Glasgow, Strike at the, 121
Locomotive Works, The Nevsky, near Petersburg, 186
Locomotives, American, 16, 141, 226, 255, 264, 329, 472
Locomotives, American, in Switzerland, 141
Locomotives in Belgium, 305
Locomotives on the Bombay, Baroda, and Central India Railway, 14, 61
Locomotives on the Chicago, Milwaukee, and St. Paul Railroad, 532
Locomotives, Coal-Dust Burning, 14
Locomotives on the Eastern of Massachusetts Railroad, 27, 61
Locomotives in France, 324
"Locomotives at the Paris Exhibition:" Errata, 416
Locomotives on the Philadelphia and Reading Railroad, 165
London Association of Foremen Engineers and Draughtsmen, Meetings of the, 30, 106, 183, 196, 241, 324
London Fire Brigade, The, 396
London and North-Western Railway, The, and Merthyr, 500
London and South-Western Railway, Doubling the, 52
London, Steam Fire Engines for, 343
London Water Supply, The, 183, 422, 519
Long Branch, America, New Pier for, 355
Lord Cranbrook at the Cyclops Works, 500
Lord Mayor of London, The, at Milford Haven, 500
Lubricants, Russian Machine, 247
Lydney Tinplate Trade, Progress of the, 258

McDougal, Mr. Neil, Manager of the Boiler Insurance Company, 283
Machine Lubricants, Russian, 247
Machinery, The Babydom of, 223
Machinery, Coal-Shipping, 283
Machinery, Wood-Working, New Work on, 183
Madeira and Mamore Railway, Progress of the, 105
Madrid and Ciudad Railway, Progress of the, 157
Magdalena Railroad, South America, Contract for the, 196
Mail Service, The Torres Straits, 225
Mails, The Australian, Contract for, 14
Major Webber, Appointment of, to attend Sir Garnet Wolseley, 479
Mansfield and its Water Supply, 343
Manufacture and Application of Steel, Modern, 313
Manufacture of Iron in India, The, 27
Map, Geological, of South-Western Virginia, 126
Marine Works in Greece, 396
Marten, Henry, appointed Engineer to the Severn Commission, 396
Matériel for the Belgian State Railways, 406
Mechanical Industry, American, 84, 247, 490
Mechanical Industry, Belgian, 226
Mechanical Industry, French, 226
Meeting of the Agricultural Engineers' Association, 415
Meeting, Annual, of the Darlington Iron Company, 263
Meeting, Annual, of the Mining Association of Great Britain, 206
Meeting of the Avonside Engine Company, 294
Meeting of the Bristol Water Works Company, 253
Meeting of Delegates from Welsh Collieries, 216
Meeting of the Iron and Steel Institute, 363
Meeting of the Liverpool Engineering Society, 52
Meeting of the Nantyglo and Blaina Iron Works Company, 526
Meeting of the Peterhead Harbour Board, 77
Meeting of the Phosphor-Bronze Company, 166
Meeting of the Royal Institution of Great Britain, 126
Meeting of the Severn Bridge Railway Company, 165
Meeting of the Society of Arts, 321
Meeting of the South Wales Institute of Engineers, 343
Meeting of Tinplate Workers at Llandaff, 343
Meetings of the Chesterfield and Derbyshire Institute of Engineers, 77, 376
Meetings of the Cleveland Institution of Engineers, 99, 121, 136, 363
Meetings of the Edinburgh Association of Science and Art, 363, 396
Meetings of the Edinburgh and Leith Engineers' Society, 77, 216, 313, 421, 460
Meetings of the Engineering Society, King's College, 147, 153, 193, 255
Meetings of the Fairfield Association, Glasgow, 77, 165, 226, 324, 376
Meetings of the Institution of Civil Engineers, 57, 168, 202, 255, 275, 376, 402, 415, 466
Meetings of the Institution of Engineers and Shipbuilders, Scotland, 263, 376, 443
Meetings of the London Association of Foremen Engineers and Draughtsmen, 30, 106, 183, 196, 241, 324
Meetings of the Meteorological Society, 193, 290
Meetings, Quarterly, of the Cleveland Iron Trade, 30, 314
Meetings of the Royal Scottish Society of Arts, 49, 94, 136, 263, 376, 421, 460
Meetings of the Royal Society of Edinburgh, 36, 77, 196
Meetings of the Swansea Harbour Trust, 52, 500
Melbourne, A Disputed Dock at, 16
Melbourne, The Water Supply of, 255
"Mercury," H.M.S., Trial Trip of, 283
Merryweather's Steam Fire Engines for Szegedin, 278
Merthyr and the London and North-Western Railway, 500
Metallurgy, Belgian, 225
Metallurgy, The World's, 517
Meteorological Society, Meetings of the, 193, 290
Metric System, The, 443
Metropolis Toll Bridges, Act of 1877, The, 72
Metropolitan Board, The, and the Thames, 36
Metropolitan Water Supply, The, 183, 422, 519
Mexborough Water Supply, The, 49
Mexican Exhibition, A, 30, 305, 438
Mexican Railway Workshops, 255
Middlesbrough, The Failures in, 436, 487
Mild Steel, 125
Mild Steel, Krupp's, 371
Milford Docks, The, 30
Milford Haven, The Lord Mayor of London at, 500
Mills, Cotton, in Poland, 186
Mineral, Discovery of a New, 61
Minerals, Algerian, 443
Minerals, Belgian, 226
Miners, The; Reckless Competition and Railway Monopoly, 519, 580
Mines, The Ebbw Vale Steel, Coal, and Iron Company's, Closing of the, 416
Mining Association of Great Britain, Annual Meeting of the, 206
Mining, Gold, in Victoria, 196, 512
Mining in New Zealand, Quartz, 27
Mississippi Jetties, The, 77
Monmouthshire Collieries, The, 294
Monmouthshire Railway and Canal Bill, The, 10
Monmouthshire Railway, Progress of the, 283
Monster Ferry Steamer, An American, 278
Mont Gambier and Rivoli Railway, Progress of the, 511
Mumbles Head, Telegraphic Communication with the, 196, 216, 236
Murray Bridge, Completion of the, 512

Nairn, Proposed Sewage Works for, 216
Nantyglo and Blaina Iron Works Company, Meeting of the, 526
Narrow Gauge, Introduction of the, at Clevedon, 416
Narrow Gauge Lines, French, 126
National Water Supply, Sewage, and Health, 204
Naval Arm, A New Swedish, 103
Naval Engineers, 30
Navigation New Pits, Harris's, Progress of, 324, 416, 500
Navigation, Steam, on the River Danube, 27, 226
Navy, The German, Progress of, 363
Navy, The Russian, Progress of, 186
Navy, The United States, 27
Neath Valley, The Colliers in the, 443
Nevsky Locomotive Works, near Petersburg, The, 186
New South Wales Railways, Progress of the, 61, 490
New York Central Railroad, Permanent Way on the, 84
New York and Havre, New Steamship Line between, 355
New York Elevated Railroad, Progress of the, 27, 126, 168, 472
New York Exhibition of 1883, The, 577
New York, Railroads in, 126, 278
New Zealand and the Americans, 109
New Zealand Coal, 16
New Zealand, Iron in, 241
New Zealand Lighthouses, 490
New Zealand Ornamental Woods, 532
New Zealand Railways, Progress of the, 30, 84
New Zealand Road Making, 404
New Zealand Telegraphy, 355, 490
Newport, Trade at, 10, 52, 141, 343, 482
Nicaragua Canal, The, 430
Nine Hours' Question, The, at Cleveland, 121, 136
Noise of Escaping Steam, Obviating the, 555
Normanton, Air-Compressing Engines at, 99
North-East Ports of Scotland, Shipbuilding Progress at the, 49
Northern of France Railway, Tyres for the, 27
Nova Scotian Coal, 406
Nuisance, The Telegraph Post, 216

Oban Railway, Contract for the, 324
Obouchoff Steel Works, Progress of the, 186, 506
Offices, New Government, at Cardiff, 416
Offices, Proposed New Vestry, at Sheffield, 275
Old Car Wheels, Utilising, 578
Ordnance, American, 84
Ore, Spanish Iron, 363
Ores, Portuguese Iron, 336
"Orient," Steamer, Launch of the, 500
Outlook in Cleveland, The, 460

Pacific Telegraph, A Proposed, 205
Paris Exhibition, The Late, 278
Paris, Gas in, 225
Paris to Marseilles, Fast Trains from, 406
Paris Water Supply, The, 34
Parliamentary Powers, Applications for, 99
Pateley Bridge Water Supply, The, 321
Patent Bill, The, 402
Peat Company, The West of England, Compressed, Dividend of, 294
Pembroke Dockyard, The, 10
Penarth Dock, Large Quantity of Coal Shipped from, 416
Pennsylvania Iron Trade, Progress of the, 27
Pensher Collieries, Proposed Re-opening of the, 283
Permanent Way on the Allegheny Valley Railroad, The, 443
Permanent Way on the East Indian Railway, 106
Permanent Way on the Eastern of Massachusetts Railroad, 27
Permanent Way, Iron, in Belgium, 147
Permanent Way on the New York Central Railroad, 84
Permanent Way on the Paris, Lyons, and Mediterranean Railway, 490
Permanent Way on the Pittsburgh, Cincinnati, and St. Louis Railroad, 472
Perry, Mr. J., Death of, 294
Petroleum, Gallician, 255
Petroleum Refining in Canada, 84
Philadelphia and Reading Railroad, Locomotives on the, 105
Philadelphia and Reading Railroad, Rails for the, 532
Phosphor-Bronze Company, Meeting of the, 166
Pier, The Coney Island, 532
Pier, The Hornsea, Progress of, 216
Pier, New, for Long Branch, America, 355
Pier, Proposed New, at Torquay, 196
Pig, Foundry, in North-Eastern France, 443
Pig Iron, American, 255
Pig Iron, Krupp's Patent for, 116
Pig Iron Market, The Glasgow, 10, 35, 49, 77, 94, 121, 136, 165, 183, 196, 216, 236, 263, 278, 313, 324, 363, 376, 396, 421, 443, 460, 482, 500, 519, 579
Pig Iron in Pennsylvania, 141
Pig Iron in the United States, The Cost of, 84
Pipe-Founding Trade, Scotland, Progress of the, 278
Pits, Coal, The Proposed Stoppage of Work at, 519
Pits, Harris's New Navigation, 324, 416, 500
Pittsburgh, Cincinnati, and St. Louis Railroad, Permanent Way on the, 472
Plymouth and Abernant Collieries, Reduction of Wages at the, 77
Pontefract Park, Proposed Lake in, 30
Pontefract Town Hall, The New, 402
Pontefract and the War Office, 99
Population of Indian Cities, The, 532
Port of Dunkerque, Proposed Improvement of the, 226
Portishead Dock Gate, The, 324
Portishead Dock, Opening of the, 396
Portree Harbour, Graving Slip in, 313
Ports, South Australian, Progress of, 375
Poti and Batoum Railway, The Proposed, 186
Portsmouth Dockyard, Reductions at, 141
Portuguese Railways, Progress of the, 84
Powell-Duffryn Collieries, Reduction of Wages at the, 165
Presentation to Mr. J. A. Lynch for Repairs at Sea, 126
Presentation of a Piece of Plate to Mr. Henry Chapman, 10
President of the French Institution of Civil Engineers, Election of the, 84
Prince Edward Island Railway, Appointment of Superintendent and Engineer to the, 436
Profits of the United States Rolling Stock Company, 223
Prussia, Coal in, 51
Public Works, New, at Bridlington, 343
Public Works in New South Wales, 202
Pullman Cars, 226
Pumps, American Steam, 84
Purchase of the Avonmouth Docks, Proposed, 324

Quarterly Meetings of the Cleveland Iron Trade, 30, 314
Quarts Mining in New Zealand, 27
Queen's Dock, Hull, Improvements of, 141
Queensland Telegraphy, 512
Quick Despatch at Swansea, 482

Rail, A Third, on the New York, Lake Erie, and Western Railroad, 61
Railroad Cars, American, 362
Railroad Cars, Heating and Ventilating, 490
Railroad Extension, American, 105
Railroad, the Lehigh Valley, Progress of, 247
Railroad, The Magdalena, South America, Contract for, 196
Railroad Movements at New York, 126, 278
Railroad, The New York Elevated, Progress of, 27, 126, 168, 472
Railroad, The Pittsburgh, Cincinnati, and St. Louis, Permanent Way on, 472
Railroad, The Southern Pacific, Progress of, 275
Railroads in New York, 126, 278
Rails on the Berg and Mark Railway, 167
Rails, English, on the Continent, 255
Rails for the Philadelphia and Reading Railroad, 532
Rails, Sheffield, and the Americans, 438
Rails, Steel, for Alsace and Lorraine, 84
Rails, Steel, in Belgium, 226
Rails, Steel, in Bosnia, 105
Rails, Steel, on the Boston and Albany Railroad, 200
Rails, Steel, on the Central Pacific Railroad, 27
Rails, Steel, on the Chicago, Milwaukee, and St. Paul Railroad, 512
Rails, Steel, on the Cleveland and Pittsburgh Railroad, 125
Rails, Steel, Extraordinary Production of, 438
Rails, Steel, in France, 336
Rails, Steel, in Germany, 61, 314
Rails, Steel, on the Illinois Central Railroad, 177
Rails, Steel and Iron, in the United States, 84
Rails, Steel, for Italy, 512
Rails, Steel, from the New Russian Iron Works, 186
Rails, Steel, for the New York, Lake Erie, and Western Railroad, 200
Rails, Steel, for the North-Eastern Railway Company, 121
Rails, Steel, in Pennsylvania, 61, 167
Rails, Steel, on the Union Pacific Railroad, 278
Rails in the United States, 61, 84, 226
Railway, The Adelaide and Nairne, Progress of, 278
Railway Brakes, Damages for the Failure of, 497
Railway Bridge over the Clyde, The New Caledonian, 324, 500
Railway, The Canadian Pacific, Progress of, 265, 278
Railway and Canal Bill, The Monmouthshire, 10
Railway, The Clifton Extension, Progress of, 500
Railway, The Cochin and Travancore, Progress of the, 321
Railway Company, An Unfortunate, 196
Railway Competition and Reckless Competition; The Miners, 519, 580
Railway Contracts, Canadian, 255
Railway, The Donetz, Russia, Opening of, 186
Railway Extension, The Callander and Oban, 324
Railway to Hull, The Proposed New Line of Railway to, 466, 482, 519,
Railway Improvements, Great Western, 30
Railway, The Madrid and Ciudad-Real, Progress of, 157
Railway, The Mamore and Madeira, Progress of, 105
Railway Material, The Life of, 498
Railway Matériel, American Shipments of, 83
Railway, The Monmouthshire, Progress of, 283
Railway Monopoly in the Coal Traffic, 519, 580
Railway, New, between Seamer and Pickering, 580
Railway, A New, in South Wales, 500
Railway, New, in Yorkshire, 183
Railway, The Paris, Lyons, and Mediterranean, Permanent Way on, 490
Railway, Prince Edward Island, Appointment of Superintendent and Engineer to the, 436
Railway, The Proposed Church Fenton, 258
Railway, The Proposed Poti and Batoum, 186
Railway Rates, The North-Eastern, and the Cleveland Iron Trade, 283
Railway, The Rivoli and Mount Gambier, Progress of, 511
Railway, The Severn Bridge, Progress of, 10
Railway Statistics, The Caledonian, 314
Railway, The Swindon and Highworth, Progress of, 196
Railway, The Swinton and Knottingley, Progress of, 183, 314, 421
Railway, The Tasmanian Main Line, Progress of, 84
Railway Taxes in Russia, 247
Railway Travelling, French, 580
Railway Tyres, Russian, The Price of, 186
Railway Working Expenses, French, 532
Railway Working Expenses, The Great Western, 196
Railway Workshops, Mexican, 255
Railways, The Australian, Progress of, 222, 386, 436
Railways, The Austro-Hungarian, Progress of, 141
Railways, The Baden, 324
Railways, The Belgian State, Matériel for, 406
Railways, The Canadian, Progress of, 100, 214
Railways, The Costa Rica, Progress of, 555
Railways in the East, Progress of, 532
Railways, The French, Progress of, 125, 157, 532
Railways, Italian, Progress of the, 416
Railways in Japan, 156
Railways, The New South Wales, Progress of, 61, 490
Railways, The New Zealand, Progress of, 30, 84
Railways, The Portuguese, Progress of, 84
Railways, The Russian, Progress of, 472
Railways, The South Australian, Progress of, 216, 386
Railways, The Spanish, Progress of, 204
Railways and Steamers, 450
Railways, The Swiss, Progress of, 202
Railways, The Victorian, Progress of, 8, 456
Rapid Production of Steel Rails, 226
Reclamations at Auckland, New Zealand, 321
Reduction of 15 per Cent., The Proposed, in the North of England, 324
Reduction of Ironworkers' Wages in Scotland, 482
Reeves, Mr. S. J., Death of, 61
Refining Petroleum in Canada, 84
Refrigerator Cars, Iron Tubing for, 555
Regulation of Public Clocks in Glasgow, 136
Reid, Mr. J., and the Glasgow Tramway System, 324
Repairs at Sea, Presentation to Mr. Lynch for, 126
Report of the Bristol Wagon Works Company, 526
Report of Brown, Bayley, Dixon, and Company, 223

Report of John Brown and Company, 580
Report, Half-yearly of the Caledonian Railway Company, 216
Report, Half-Yearly, of the Glasgow and South-Western Railway Company, 216
Report, Half-yearly, of the Highland Railway, 324
Retford Water Works, The, 216
Rhondda, Winding Engines for the, 94
Rhymney Railway, Wages on the, 77
Rhymney Valley, Trade in the, 183, 482
Rifles, American, for Turkey, 497
River Brisbane, Queensland, Proposed Improvement of the, 225
River Delaware, Steam Shipbuilding on the, 472
River Hudson, Tunnelling the, 290
River Steamer, An American Steel, 472
River Taff, New Bridge over the, 396
River Volga, Railway Bridge over the, 247
Rivers Conservancy Bill, The, 363
Rivers Pollution, Salmon, 438
Road Making in New Zealand, 404
Rolling Stock on the Eastern of France Railway, 490
Rolling Stock on the Union Pacific Railroad, 336
Rosedale and Ferryhill Company, Failure of the, 77, 99
Rotherham, Improvements in, 99
Rotherham, An Independent Board for, 10
Route to France, The Cherbourg, 283
Royal Institution of Great Britain, Meeting of the, 126
Royal Scottish Society of Arts, Meetings of the, 49, 94, 136, 263, 376, 421, 460
Royal Society of Edinburgh, Meetings of the, 36, 77, 196
Russia, Gold in, 532
Russian Army, Cotton for the, 506
Russian Furnace, A New, 186
Russian Iron Works, New, 186
Russian Machine Lubricants, 247
Russian Navy, Progress of the, 186
Russian Railways, Progress of the, 472
Russian Telegraphic Report, 247
Russian Trade Reports, 186

St. Gothard Tunnel, The, 36, 125, 222, 226, 263, 580
St. Louis, Kansas City, and Northern Railway, Bridges for the, 511
Salmon Rivers Pollution, 438
San Francisco, Coal at, 255
Sanitary Engineering, An Opening for, 141
Sanitary Improvements in Leeds, 236
Sanitary Institute of Great Britain, The, 506
Saw, Gigantic, for the Sydney Exhibition, 402
Scarborough Harbour Works, The, 500
Scotch Bills in Parliament, 263, 278
Scotch Pipe-Founding Trade, Progress of the, 278
Scott-Moncrieff's Pneumatic Tramway Engine, 49
Sea Defences at Bridlington, New, 49
Sea at Filey, The, 258
Seamer and Pickering, New Railway between, 580
Sensible Conclusion, A, 165
Serious Fires in Scotland, 94
Severn Bridge Railway Company, Meeting of the, 165
Severn Bridge Railway, Progress of the, 10
Severn Commission, Mr. Henry Marten appointed Engineer to the, 396
Severn Tunnel, Progress of the, 183
Sewage, Glasgow, The Disposal of, 376
Sewage, The Keighley, 121
Sewage, Salisbury, The Disposal of, 416
Sewage of Twickenham, The, 321
Sewage, Water Supply, and Health; Conference of the Society of Arts, 416
Sewage Works for Nairn, Proposed, 216
Sewerage, The Duffield, 77
Sheffield, Improvements in, 10, 30, 141, 216, 275, 482
Shipbuilding Contracts, New, on the Clyde, 216
Shipbuilding and Engineering, The Cleveland, Progress of, 9, 52, 77, 136, 165, 183, 196, 216, 283, 324, 396, 460, 487, 526
Shipbuilding and Engineering Trades, Scotland, Wages in the, 10, 35, 94, 121, 196, 216, 236, 263, 376, 421, 482
Shipbuilding Firm, Failure of a Scotch, 396
Shipbuilding Industry, American, 166
Shipbuilding Progress at the North-East Ports of Scotland, 49
Shipbuilding, Steam, on the Delaware, 472
Shipbuilding Trade, The Clyde, Progress of, 196, 396
Shipments of Coal, Large, from Penarth Dock, 416
Ships in Progress at Devonport Dockyard, 216
Shipwrights of Scotland, The Associated, and Mr. Donald Currie, 77
Sir Henry Bessemer, 482
Sirhowy, The Blowing out of Blast Furnaces at, 10
Sirhowy Works, The, 443, 456
Sleepers, Iron, in Belgium, 294
Sleepers, Mr. Wood's Wrought-Iron, 263
Sliding Scale, The, 324
Small Arms, American, Increased Manufacture of, 555
Snow Drifts on Russian Railways, 247
Snow Thawing, 204
Society of Arts, The Cantor Lectures at the, 126
Society of Arts, Election of Mr. H. T. Wood as Secretary, 200
Society of Arts, Meeting of the, 321
Sounding the Channel, 354
South Australia, The Water Supply of, 336, 512
South Australian Harbour Accommodation, 27
South Australian Ports, Progress of, 375
South Australian Railways, Progress of the, 216, 336
South Australian Telegraphy, 305
South Bank and Clay-lane Iron Works, Sale of the, 165, 283
South Kensington Museum, The Crace Collection at, 147
South Medomsley Colliery, The Sale of, 498
South Wales Coal Shipments, 77
South Wales, Colliers' Wages in, 396, 456, 482
South Wales Institute of Engineers, Meeting of the, 343
South Wales, A New Railway in, 500
South Wales Tin-Plate Trade, Progress of the, 482
South Welsh Coal Trade, The, 10
South Western Virginia, Geological Map of, 126
South Yorkshire Engineering Trades, Progress of the, 466, 580
Southern of France Railway, Working Expenses on the, 443
Southern Pacific Railroad, Progress of the, 275
Spain, Coal in, 27, 84
Spanish Railways, Progress of the, 204
Speed on the Great Western Railway, 456
Spur Wheel, A Durable, 147
Station Extensions, Leeds, 49
Station, New, for the Midland Railway, at Ilkeston, 402
Statistics, The Caledonian Railway, 314
Steam Fire Engines for London, 343
Steam Fire Engines for Szegedin, Merryweather's, 278
Steam Line, New American, 105
Steam Line, New French, 512
Steam Navigation, French, 490
Steam Navigation on the River Danube, 27, 226
Steam Pumps, American, 84
Steam Shipbuilding, American, Progress of, 27
Steam Shipping, British, Annual Statement of the, 507
Steam Tramways at Swansea, 258
Steamers, The Blue Star Line of, 27
Steamers and Railways, 450
Steamers, The World's, 226
Steamship Line, New, between New York and Havre, 355
Steamships, Improved Dockhouse for, at New York, 247
Steel in Belgium, 286
Steel Company, Baird's, Russia, Progress of, 506
Steel for the East River Bridge, 512
Steel in France, 286
Steel Gun, Krupp's Great, 363
Steel and Iron Rails in the United States, 84
Steel, Krupp's Mild, 371
Steel Making, Bessemer, at Rhymney, 579
Steel Manufactory at Essen, The Krupp, 580
Steel Manufacture, Important Experiments in, at Sheffield, 519
Steel, Mild, 125
Steel, Modern Manufacture and Application of, 313
Steel Process, The Thomas-Gilchrist, 363
Steel Question, The, in Cleveland, 52, 324
Steel Rails for Alsace and Lorraine, 84
Steel Rails in Belgium, 226
Steel Rails in Bosnia, 105
Steel Rails on the Boston and Albany Railroad, 200
Steel Rails on the Boston and Maine Railroad, 61
Steel Rails on the Central Pacific Railroad, 27
Steel Rails on the Chicago, Milwaukee, and St. Paul Railroad, 512
Steel Rails on the Cleveland and Pittsburgh Railroad, 125
Steel Rails, A Contract for, 141
Steel Rails, Extraordinary Production of, 438
Steel Rails in France, 336
Steel Rails in Germany, 61, 314
Steel Rails on the Illinois Central Railroad, 177
Steel Rails for Italy, 512
Steel Rails from the New Russia Iron Works, 186
Steel Rails for the New York, Lake Erie, and Western Railroad, 200
Steel Rails for the North-Eastern Railway Company, 121
Steel Rails in Pennsylvania, 61, 167
Steel Rails, Rapid Production of, 226
Steel Rails on the Union Pacific Railroad, 278
Steel Rails in the United States, 61, 84, 226
Steel Sleepers, Belgian, 235
Steel Steamers, American, 255, 472
Steel Trade, The Cleveland, Progress of, 216, 236, 263, 324, 436, 579
Steel Works, The Ebbw Vale, Progress of, 283
Steel Works, The Landore, 52
Steel Works, The Obouchoff, Progress of, 506
Steel Works in Pennsylvania, 247
Stone and Coal in Queensland, 255
Stoppage of the West Stockton Iron Company, 579
Street Cars, Compressed Air Motors for, 490
Street Improvements in Sheffield, 30
Strength of the Brooklyn Bridge, The, 406
Strike in the Coal Trade, and its Effect on Cleveland, 314
Strike at the Dowlais Colliery, 456
Strike of the Durham Miners and the Cleveland Iron Trade, 294, 416
Strike at the Glasgow Locomotive Works, 121
Strikes in South Yorkshire, 30
Students of the Institution of Civil Engineers, Annual Dinner of the, 466
Submarine Work in New York Harbour, 472
Submerged Cable Towage, 147
Suez Canal, The, 61, 84, 167, 226, 435
Sugar Refineries, The Greenock, 94
Surveys, Australian Coast, 167
Suspension of an Ironmaking Firm at Middlesbrough, 416
Swansea Harbour Trust, Meetings of the, 52, 500
Swansea, New Dock at, 482
Swansea, Trade at, 10, 52, 165, 343, 456, 526
Swedish Naval Arm, A New, 103
Swindon and Highworth Light Railway, Progress of the, 196
Swinton and Knottingley Railway, Progress of the, 183, 314, 421
Swiss Railways, Progress of the, 202
Sydney International Exhibition, The, 526
Szegedin Disaster, The, 362

Tasmanian Main Line Railway, Progress of the, 84
Taxes, Railway, in, Russia, 247
Telegraph Company, The Great Northern, 84, 157, 226
Telegraph, A New Writing, 120
Telegraph Post Nuisance, The, 216
Telegraph, A Proposed Pacific, 205
Telegraphic Communication with the Mumbles Head, 196, 216, 236
Telegraphic Report, Russian, 247
Telegraphs, German Underground, 475
Telegraphy, Australian, 84, 153, 167, 305
Telegraphy at Honduras, 532
Telegraphy, Queensland, 512
Telegraphy, New Zealand, 255, 490
Telephone Scheme in Sheffield, New, 343
Testimonial to Mr. Henry Chapman, 10
Thawing Snow, 204
Third Rail on the New York, Lake Erie, and Western Railroad, A, 61
Thirsk and its Water Supply, 121
Tides, High, in the Severn, 324
Timber Lands, The Destruction of, 167
Tin-Plate Trade at Lydney, Progress of the, 258
Tin-Plate Trade of South Wales, Progress of the, 482
Tin-Plate Workers, Meeting of, at Llandaff, 343
Tin Works, The Waterloo, 216
Torpedo Boat, Yarrow and Company's Fast, 234
Torpedo Boats, The Herreshoff, 506
Torpedo Vessel, New French, 511
Toll Bridges Act of 1877, The Metropolis, 72
Torquay, Proposed New Pier at, 196
Torres Straits Mail Service, The, 225
Towage, Submerged Cable, 147
Town Hall, Pontefract, The New, 402
Town, A, and its Water Supply, 314
Trade at Cardiff, 10, 141, 165, 241, 258, 456, 482, 526
Trade Disputes at Cleveland, 30
Trade in the Forest of Dean, 10, 196, 343, 500
"Trade, Increasing," An Extraordinary, 275
Trade at Newport, 10, 52, 141, 343, 482
Trade Reports, Russian, 186
Trade in the Rhymney Valley, 183, 482
Trade in South Wales, 258
Trade at Swansea, 10, 52, 165, 343, 456, 526
Trades, The Heavy, in South Yorkshire, 500
Trades Unionism in a Coatbridge Iron Works, 136
Trains, Fast, from Paris to Marseilles, 406
Tramway for Adrianople, A, 532
Tramway Cars, American, 224
Tramway Engine, Scott-Moncrieff's Pneumatic, 49
Tramway Locomotive, A New, 84
Tramway System, The Glasgow, and Mr. J. Reid, 324
Tramways, The Adelaide and Mitcham, Progress of, 236
Tramways at Adelaide, South Australia, 216
Tramways, The Bristol, Progress of, 196, 294
Tramways at Bremen, 393
Tramways at Bucharest, Progress of, 193
Tramways at Chesterfield, 321
Tramways at Cologne, 275
Tramways Extension, Bristol, 196
Tramways, The Gloucester, Progress of, 116, 456
Tramways, St. Petersburg, Accidents on, 247
Tramways, Steam, at Swansea, 258
Treasury in the United States, Fortifying a, 168
Tube Wells, Artesian, at Skegness, 438
Tunnel, The St. Gothard, 36, 125, 222, 226, 263, 580
Tunnel, The Severn, Progress of, 183
Tunnelling the River Detroit, 486
Tunnelling the River Hudson, 290
Turkey, War Material for, 206
Turntables in Belgium, Contracts for, 141
Twickenham, The Sewage of, 321
Tyres for the Northern of France Railway, 27
Tyres, Russian Railway, The Price of, 186

Underground Telegraphs, German, 475
Unfortunate Railway Company, An, 196
Unicorn Line, The, 200
Union Pacific Railroad, Rolling Stock on the, 336
United States Navy, The, 27
United States, Rails in the, 61, 84, 226
United States Rolling Stock Company, Profits of the, 223
University, The Frith, Sheffield, 466
Use of Dried Bread, Curious, 247

Vacuum Brake Trials, 363
Ventilating and Heating Railroad Cars, 490
Vestry Offices, Proposed New, at Sheffield, 275
Victor Harbour, South Australia, Progress of the, 168
Victoria, An American Diamond Drill for, 14
Victoria, Coal in, 532
Victorian Gold Mining, 196, 512
Victorian Railways, Progress of the, 8, 456
Virginia, South Western, Geological Map of, 126

Wages in Dean Forest, Colliers', 196
Wages at Dowlais, Colliers', 396, 456
Wages in the Engineering and Shipbuilding Trades, Scotland, 10, 35, 94, 121, 196, 216, 236, 263, 376, 421, 482
Wages in the Engineering Trade of South Yorkshire, 466, 580
Wages and the Fifty-Hour Movements at Glasgow, 35, 77, 196, 216, 236, 263, 376, 421, 482
Wages in Japan, 428
Wages at the Powell-Duffryn Collieries, Reduction of, 165
Wages, Proposed Reduction of, by the Blaenavon Iron and Steel Company, 52, 94
Wages, Reduction of, at the Plymouth and Abernant Collieries, 77
Wages on the Rhymney Railway, 77
Wages in South Wales, Colliers', 396, 456, 482
Wagon Works Company, Bristol, Report of the 526
War Material for Turkey, 206
War Office, The, and Pontefract, 99
Warehouse, A Monster Cotton, in New Orleans, 61
Water Company, New, in the Dearne Valley, 30
Water Scheme, The Dronfield, 196, 314
Water Supply, The Cardiff, 381
Water Supply of Doncaster, The, 10, 402
Water Supply, The Goole, 216
Water Supply of Mansfield, The, 343
Water Supply of Melbourne, The, 255
Water Supply, The Metropolitan, 183, 422, 519
Water Supply, The Mexborough, 49
Water Supply, National, Sewage, and Health, 204
Water Supply of Paris, The, 34
Water Supply, The Pateley Bridge, 321
Water Supply, Sewage, and Health; Conference of the Society of Arts, 416
Water Supply of South Australia, The, 336, 512
Water Supply of Thirsk, The, 121
Water Supply, A Town and its, 314
Water Works, The Bristol, 258, 283
Water Works of Dundee, The, 94
Water Works, The Edinburgh New, 519
Water Works, The Frome, 416
Water Works, The Retford, 216
Waterloo Tin Works, The, 216
Watt, James, Anniversary, The, 77
Wauntreodd Works, near Cardiff, Closing of the, 216
Webber, Major, Appointment of, to attend Sir Garnet Wolseley, 479
Welbeck, Improvements in, 99
Well, Artesian, in the Crimea, 247
Wellington, New Zealand, Discovery of Graphite in, 142
Wells, Artesian, in South Australia, 255
Wells, Artesian Tube, at Skegness, 438
West of England Compressed Peat Company, Dividend of the, 294
West Stockton Iron Company, Stoppage of the, 579
Western Australia, A Loan for, 19
Western Australian Railways, Progress of the, 436
Westphalian Coal, 200
Wick Harbour, 165, 443
Wilson, Mr. Isaac, M.P., 498
Winding Engines for the Rhondda, 94
Winding-up Welsh Works, 77
Wood, Mr. H. T., elected Secretary of the Society of Arts, 200
Wood-Working Machinery, New Work on, 183
Woods, New Zealand Ornamental, 532
Workhouse and Vestry Offices, New, at Sheffield, 275
Working Expenses on the Southern of France Railway, 443
Works, The Baltic, Progress of, 506
Works, The Borsig, Germany, 168
Works, The Kolpino, Progress of, 506
Works, Marine, in Greece, 396
Works, Public, in New South Wales, 202
Works, The Sirhowy, Progress of, 443, 456
Works, Steel, in Pennsylvania, 247
World's Metallurgy, The, 517
World's Steamers, The, 226
Writing Telegraph, A New, 120
Wrought-Iron Sleepers, Mr. Wood's, 263

Yarra Old Dock, The, 196
Yarrow and Company's Fast Torpedo Boat, 234
Yarrow's Light-Draught Steamers for Columbia 283

LETTERS TO THE EDITOR.

Air, Carburetted—John Henry Knight, 465
Air, Carburetting—Denny Lane, 438
Air, Carburetting—William Lyon, 343, 518

"Babyhood of Machinery," The—Alex. B. W. Kennedy, 234
Balance, The Induction—D. E. Hughes, 283
Balance, An Induction—C. W. Winter, 486
Boiler-Drilling Machine, Tweedy's—John Tweedy, 415
Boilers, Steel—James Spence, 434
Bridge, Sedley's—Anglo-American, 466, 511
Bridge, The Tower—Angelo J. Sedley, 486.
Bridges, Swing—Live Roller, 321

Canal, The Interoceanic—Frederick M. Kelley, 82
Canal, The Proposed Interoceanic—Adam Scott, 435
Carburetted Air—John Henry Knight, 465
Carburetting Air—Denny Lane, 438
Carburetting Air—William Lyon, 343, 518
Chimney Draught—Robert Wilson, 15
Circular Ironclads, Gun Carriages for—C. Spencer Rolfe, 486
Circumference of the Circle, The—L. Hajnis, 193
Circumference of the Circle, The—Samuel H. Wheeler, 136
Cleveland Ores, The Preparation of Steel from—James Hargreaves, 435
Coal-Shipping Machinery—C. Graham Smith, 293
Courtenay's Self-Acting Syren Buoy—R. M., 516
Crenaût—The. Booth, 16

Drainage and Sewage Disposal, Stoke—Malcolm Paterson, 321
Drainage of Szegedin, The—John and Henry Gwynne, 321
Draught, Chimney—Robert Wilson, 15
Dumpy Level, The—Francis W. Dean, 48
Duplex Gauges—Edouard Bourdon, 135
Duplex Gauges—John Dewrance and Co., 100
Durable Spur Wheel, A—L. O. H., 136
Durable Spur Wheel, A—Millwright, 135
Durable Spur Wheel, A—W. Rawlinson, 153

Economical Efficiency of Engines, The—Wm. Bury, 578
Edison Light, The—Walter H. Thelwall, 193
Electric Light on the Thames Embankment, The—Ransomes, Sims, and Head, 438
Electric Lighting—Geo. S. Dwight, 133
Electric Lighting—W. Radcliffe Ward, 343
Electric Vote Recorders—Alex. Turnbull, 135
Engine Design, Traction—William Fletcher, 233
Engine Design, Traction—W. M. F. R., 74
Engineers, The Institution of Civil—Another Engineer Associate, 15
Engineers, The Institution of Civil—Nottobe Satupon, 153
Engineers, The Institution of Civil—A Professional Associate, 133
Engineers, The Students of the Institution of Civil—A. E. Baldwin, F.G.S., Stud. Inst. C.E., 579
Engineers, The Students of the Institution of Civil—Robert H. Read, 579
Engineers, The Students of the Institution of Civil—Student of the Institution of Civil Engineers, 519
Engineers, The Institution of Mechanical—Walter R. Browne, 234
Engines, The Perkins System of—Wm. Bury, 465, 497
Engines, The Perkins System of—R. J. W., 487
Explosion, The "Thunderer"—W. Hope, 133
Explosion, The "Thunderer"—William W. Hulse, 193
Explosion, The "Thunderer"—J. A. Longridge, 190
Explosion on the "Thunderer," The—C. W. Merrifield, 76
Explosion on the "Thunderer," The—W. Richardson, 48
Explosion, The "Thunderer"—Uniform Twist, 100, 190, 133
Explosion on the "Thunderer," The—Victoria Cross, 48

Flow of the Severn and the Thames—D. T. Ansted, 76
Flow of Water through Orifices in Thin Plates, The—Robert D. Napier, 85
Frictional Resistances of Rolling Mills, The—E. Freytag, 146

Gauges, Duplex—Edouard Bourdon, 135
Gauges, Duplex—John Dewrance and Company, 100
Gun Carriages for Circular Ironclads—C. Spencer Rolfe, 486

Hair-Combs, The Manufacture of—X. Y. Z., 100
H.M.S. "Iris," The Steam Trials of—G. S. Young, 342
History of the Screw Propeller, The—M. Bourmans, 292
History of the Screw Propeller—Jas. Donaldson, 193
History of the Screw Propeller, The—James Hunter, 48
History of the Screw Propeller—J. M. Roberts, 152
History of the Screw Propeller—Henry Wimshurst, 192

Ice, The Manufacture of—G. Duvallon, 283
Indian Public Works Department, Promotion in the—A. F., 152
Indian Public Works Department, Promotion in the—Stanley Civil Engineer, 267
Indian Public Works Department, Promotion in the—Vox Clamans in Sicco, 152
Induction Balance, The—D. E. Hughes, 283
Induction Balance, An—C. W. Winter, 486
Institution of Civil Engineers, The—Nottobe Satupon, 153
Institution of Civil Engineers, The—A Professional Associate, 133
Institution of Civil Engineers, The—Another Engineer Associate, 15
Institution of Mechanical Engineers, The—Walter R. Browne, 234
Interoceanic Canal, The—Frederick M. Kelley, 82
Interoceanic Canal, The Proposed—Adam Scott, 435
Iron and Mild Steel, The Mechanical Properties of—J. J. Birckel, 435, 510

Japanese Timber—John Perry, 266
Journalistic Mechanical Geniuses—Oh! Oh!! Oh!!!, 49

Level, The Dumpy—Francis W. Dean, 48
Light, The Edison—Walter H. Thelwall, 193
Light, The Electric, on the Thames Embankment—Ransomes, Sims, and Head, 438
Lighting, Electric—Geo. S. Dwight, 133
Lighting, Electric—W. Radcliffe Ward, 343

"Machinery, The Babyhood of"—Alex. B. W. Kennedy, 234
Machinery, Coal-Shipping—C. Graham Smith, 293
Magnetism, Terrestrial, The New Theory of—Alexander Muirhead, 266
Magnetism, Terrestrial, The New Theory of—Physiker, 283
Manchester Steam Users' Association, The—An Engineer, 292
Manufacture of Hair-Combs, The—X. Y. Z., 100
Manufacture of Ice, The—G. Duvallon, 283
Measures and Weights Act, 1878—Charles L. Hett, 15
Mechanical Geniuses, Journalistic—Oh! Oh!! O!!!, 49
Mechanical Properties of Iron and Mild Steel, The—J. J. Birckel, 435, 510
Mine Ventilation—Wm. Ackroyd and Bros., 213
Mine Ventilation—X., 213
Mine Ventilators—John Chatto, 153, 183, 193, 232, 320
Mine Ventilators—Charles Davy, 232
Mine Ventilators—Fresh Air, 293
Mine Ventilators—Gardner C. Hawkins, 233
Mine Ventilators—M., 153
Mine Ventilators—Manager, 153
Mine Ventilators—Mining Engineer, 293
Mine Ventilators—D. P. Morison, 153
Mine Ventilators—Natural Circulation, 183
Mine Ventilators—One of the Eight, 153, 232, 320
Mine Ventilators—One of Three, 136, 183
Mine Ventilators—Graham Stevenson, 233
Mine Ventilators—Arthur H. Stokes, 293
Mine Ventilators—T. L. G., 183
Mine Ventilators—Useful Effect, 232, 320
Molecules, The Trajectory of—W. Barnet Le Van, 152
Museum of Applied Sciences and Technical Education, A—Ralph Hart Tweddell, 497

Perkins System of Engines, The—Wm. Bury, 465, 497
Perkins System of Engines, The—R. J. W., 487
Perkins System of Steam Engineering in 1879, The—J. F. Spencer, 486
Permanent Way for Tramways—James Livesey, 322, 487, 518
Permanent Way for Tramways—Henry Vignoles, 265, 435, 510, 579
Phosphoric Pig Iron, Steel and Malleable Iron from—R. F. Mushet, 234
Priming—J. C. Graham, 100
Promotion in the Indian Public Works Department—A. F., 152
Promotion in the Indian Public Works Department—Stanley Civil Engineer, 267
Promotion in the Indian Public Works Department—Vox Clamans in Sicco, 152
Propulsion, Screw—Student, 213
Propulsion, Screw—Y., 292
Provincial Sanitation—Malcolm Paterson, 193
Pursuit of Science on a Cunard Ship, The—W., 511

River Wear, Shipbuilding on the—William Doxford and Sons, 48
Rolling Mills, The Frictional Resistances of—E. Freytag, 146
Roof Trusses, Strains on—H. G. Aubin, 266

Sandringham Water Service and Fire Appliances—J. C. Merryweather, 153
Sanitation, Provincial—Malcolm Paterson, 193
Science, The Pursuit of, on a Cunard Ship—W., 511
Screw Propeller, The History of the—M. Bourmans, 292
Screw Propeller, History of the—Jas. Donaldson, 193
Screw Propeller, The History of the—James Hunter, 48
Screw Propeller, History of the—J. M. Roberts, 152
Screw Propeller, History of the—Henry Wimshurst, 192
Screw Propulsion—Student, 213
Screw Propulsion—Y., 292
Screws, Twin—Mercantile Marine, 183
Screws, Twin—Screw Propeller, 192
Screws, Twin—W. H. White, 157
Sedley's Bridge—Anglo-American, 466, 511
Severn and the Thames, Flow of the—D. T. Ansted, 76
Shipbuilding on the River Wear—William Doxford and Sons, 48
Spur Wheel, A Durable—L. O. H., 136
Spur Wheel, A Durable—Millwright, 135
Spur Wheel, A Durable—W. Rawlinson, 153
Steam Engineering in 1879. The Perkins System—J. F. Spencer, 486
Steam Trials of H.M.S. "Iris," The—G. S. Young, 342
Steam Users' Association, The Manchester—An Engineer, 292
Steel Boilers—James Spence, 434
Steel from Cleveland Ores, The Preparation of—James Hargreaves, 435
Steel and Malleable Iron from Phosphoric Pig Iron—R. F. Mushet, 234
Stoke Drainage and Sewage Disposal—Malcolm Paterson, 321
Strains on Roof Trusses—H. G. Aubin, 266
Students of the Institution of Civil Engineers, The—A. E. Baldwin, F.G.S., Stud. Inst. C.E., 579
Students of the Institution of Civil Engineers, The—Student of the Institution of Civil Engineers, 519
Students of the Institution of Civil Engineers, The—Robert H. Read, 579
Swing Bridges—Live Roller, 321

Syren Buoy, Courtenay's Self-Acting—R. M., 510
Szegedin, The Drainage of—John and Henry Gwynne, 321

Technical Education and a Museum of Applied Sciences—Ralph Hart Tweddell, 497
Terrestrial Magnetism, The New Theory of—Alexander Muirhead, 266
Terrestrial Magnetism, The "New Theory" of—Physikus, 363
Thames Tides—J. B. Redman, 153
Thin Plates, The Flow of Water through Orifices in—Robert D. Napier, 35
"Thunderer" Explosion, The—W. Hope, 133
"Thunderer" Explosion, The—William W. Hulse, 192
"Thunderer" Explosion, The—J. A. Longridge, 120
"Thunderer," The Explosion on the—C. W. Merrifield, 76
"Thunderer," The Explosion on the—W. Richardson, 46
"Thunderer" Explosion, The—Uniform Twist, 100, 120, 133
"Thunderer," The Explosion on the—Victoria Cross, 46
Timber, Japanese—John Perry, 366
Tower Bridge, The—Angelo J. Sedley, 486
Traction Engine Design—William Fletcher, 233
Traction Engine Design—W. M. F. R., 14
Trajectory of Molecules, The—W. Barnet Le Van, 152
Tramways, Permanent Way for—James Livesey, 322, 487, 518
Tramways, Permanent Way for—Henry Vignoles, 365, 435, 510, 579
Tweedy's Boiler-Drilling Machine—John Tweedy, 415
Twin Screws—Mercantile Marine, 182
Twin Screws—Screw Propeller, 182
Twin Screws—W. H. White, 157

Ventilation, Mine—Wm. Ackroyd and Bros., 213
Ventilation, Mine—X., 213
Ventilators, Mine—Fresh Air, 293
Ventilators, Mine—John Chatto, 153, 183, 193, 232, 320
Ventilators Mine—Charles Davy, 232
Ventilators, Mine—One of the Eight, 153, 232, 320
Ventilators, Mine—Gardner C. Hawkins, 233
Ventilators, Mine—M., 153
Ventilators, Mine—Manager, 153
Ventilators, Mine—Mining Engineer, 293
Ventilators, Mine—D. P. Morison, 153
Ventilators, Mine—Natural Circulation, 183
Ventilators, Mine—One of Three, 136, 183
Ventilators, Mine—Graham Stevenson, 233
Ventilators, Mine—Arthur H. Stokes, 293
Ventilators, Mine—T. L. G., 153
Ventilators, Mine—Useful Effect, 232, 320
Vote Recorders, Electric—Alex. Turnbull, 135

Water Services and Appliances, Sandringham—J. C. Merryweather, 153
Weights and Measures Act, 1878—Charles L. Hett, 15

LONDON

Printed for the Proprietors by CHARLES WHITING, at Beaufort House Printing Offices, 30 and 32, Sardinia Street, in the Parish of St. Giles-in-the-Fields, and Published by CHARLES GILBERT, at the Office of "ENGINEERING," No. 37, Bedford-street, in the Parish of St. Paul, Covent Garden, in the County of Middlesex.—Friday, July 18, 1879.